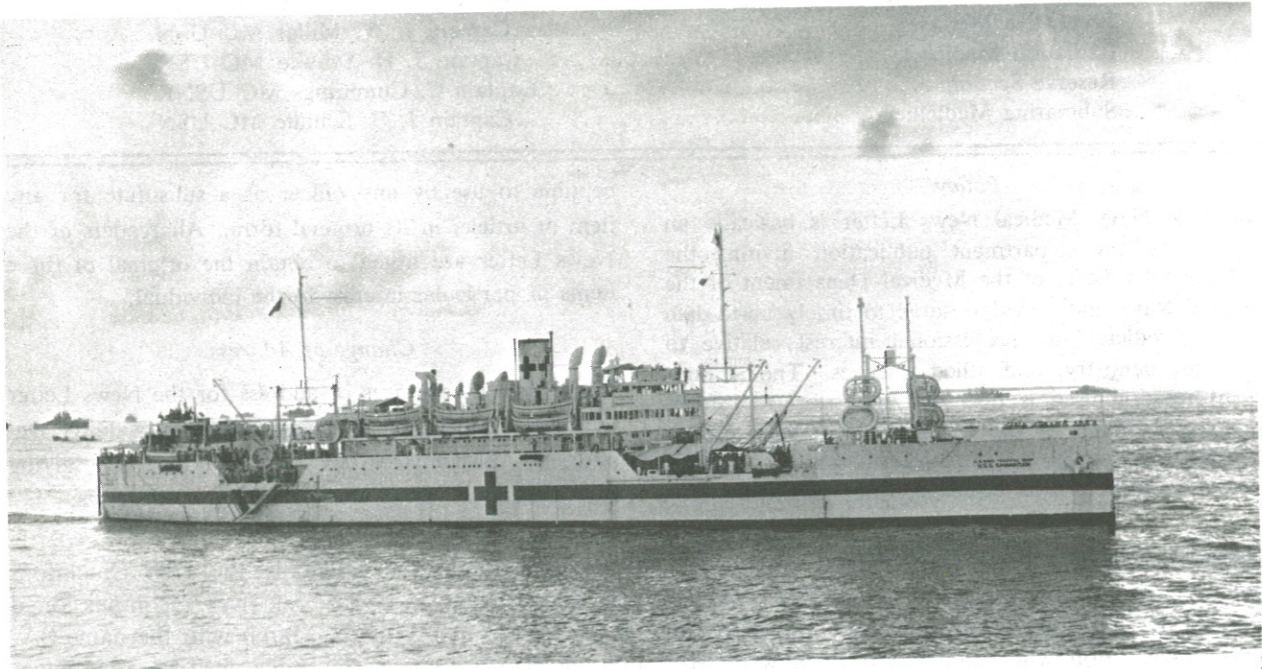


UNITED STATES NAVY *Medical News Letter*

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No. 12



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United States Navy
MEDICAL NEWS LETTER

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No. 12

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Policy

The U.S. Navy Medical News Letter is basically an official Medical Department publication inviting the attention of officers of the Medical Department of the Regular Navy and Naval Reserve to timely up-to-date items of official and professional interest relative to medicine, dentistry, and allied sciences. The amount of information used is only that necessary to inform adequately officers of the Medical Department of the existence and source of such information. The items used are neither intended to be, nor are they, sus-

ceptible to use by any officer as a substitute for any item or article, in its original form. All readers of the News Letter are urged to obtain the original of those items of particular interest to the individual.

Change of Address

Please forward changes of address for the News Letter to Editor: Bureau of Medicine and Surgery, Navy Department, Washington, D.C. 20390 (Code 18), giving full name, rank, corps, and old and new addresses.

FRONT COVER: USS SAMARITAN (AH-10). This hospital ship was originally the USS Chaumont (AP-5), an Army transport, and was first commissioned by the Navy in 1921. She was recommissioned from the Reserve Fleet in March 1944, becoming officially a ship of mercy by 24 March with the name SAMARITAN. Following transport duty between Honolulu and San Francisco, she sailed on 9 June via Kwajalein and Eniwetok to Saipan where she embarked 704 patients of the fighting there and returned with them to Kwajalein. By 8 July, she had taken aboard 504 patients in Saipan and debarked them at a base hospital in Noumea, New Caledonia. From 2-13 August, she was a station hospital at Saipan. She next carried 272 patients from Guam to Guadalcanal, and later in September embarked 607 casualties from Peleliu Islands and transferred them to a Russell Islands hospital. Later while at Ulithi, until 15 February 1945, the SAMARITAN served as a station hospital for Commander Service Squadron 10. She next sailed for Iwo Jima to evacuate casualties, and on 21 February received a 5-inch projectile, which did not explode, on the port side of the engine room. A bomb disposal officer from USS Tennessee removed the bomb, and the ship sailed to Saipan with 606 patients from two days of the Iwo Jima engagement, on 24 February being grounded a few hours on the starboard side of the Tanapag Harbor channel. On 1 March, she proceeded to Guam with 610 more patients from Iwo Jima and repeated substantially the same operation several days later. In April, May and June, she evacuated casualties from the Okinawa battle and debarked them for further treatment at fixed medical facilities on Saipan. She concluded her active service by transporting patients from hospitals in Honolulu to the United States, and serving as a station hospital at Sasebo, Japan. She was decommissioned in August 1946, having earned four Battle Stars for participation in Pacific area operations, and having won the Navy Occupation Service Medal. The SAMARITAN had an overall length of 448 feet, beam of 58 feet, a speed of 14 knots, and a displacement of 8,932 tons.

The issuance of this publication approved by the Secretary of the Navy on 4 May 1964.

SYMPTOMS AS AN INDEX OF BIOLOGICAL BEHAVIOUR AND PROGNOSIS IN HUMAN CANCER

*By Prof Alvan R. Feinstein, Departments of Medicine and Clinical Biostatistics,
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Connecticut. Nature 209(5020): 241-245, January 15, 1966.*

Most concepts of the biological behaviour of human cancer depend on the morphology of the tumour. The evidence obtained by physical, surgical, roentgenographic and microscopic examination is used to identify the site, size, cellular type, regional invasion and distant dissemination of the tumour. These identifications then form the basis for decisions about rates of growth, prognosis and treatment for the cancers of individual patients.

From these morphological assessments, physicians have evolved the therapeutic concept that a cancer is most curable when discovered early and removed completely. In this concept, a tumour is 'early' if found before it has invaded any important regional structures or spread to distant sites; and the tumour is removed 'completely' if its anatomical situation permits excision of all the visible lesion together with a wide margin of normal tissue.

These morphological principles of therapy have been repeatedly confirmed by the many cases in which prompt surgical resection has cured a patient of his or her cancer. Yet the rule has also been violated by many exceptions. Some patients have died quickly despite a prompt and apparently 'complete' excision of a cancer discovered 'early'. Other patients have had long survival with cancers that were not removed either because the patient refused operation, or because the surgeon decided not to attempt resection.

An explanation for this capricious behaviour of cancer has been proposed in a hypothesis called "biologic predeterminism"¹. According to this hypothesis, tumours with similar morphological appearance may nevertheless grow differently, and those with favourable biological growth are those most likely to be discovered 'early' in a state suitable for surgical cure. Although this hypothesis provides an attractive explanation for the observed discrepancies in behaviour of cancer, verification of the

hypothesis has been difficult because of inadequate methods for identifying 'favourable' features of growth of the tumour.

Perhaps the main reason for the inadequacy of existing methods is that they identify form without identifying function. The conventional morphological data describe the appearance of the tumour and the structural damage it has produced. But morphology does not provide direct evidence of the functional effects of the tumour on structures or systems that are not anatomically invaded, nor does the morphological appearance indicate how long the tumour has been present. The term 'early', used so often in discussions of cancer therapy, is generally applied inappropriately. Although 'early' refers to a dimension in time, the usual evidence assessed in the designation of 'early' comes mainly from anatomy, not chronometry. The evidence depends on size, lymph nodes and metastatic dissemination, not on the length of time the tumour has been present.

Additional evidence of the functional and temporal growth of a tumour is available in the symptoms the tumour produces in its human host. Yet symptoms are seldom formally analysed or correlated in the therapeutic evaluation of human cancers. Although regularly noted in diagnostic decisions, and in the informal reasoning of 'clinical judgment', symptoms are usually not specifically cited, categorized, and analysed in the evaluations of prognosis and therapy. One main reason for the neglect of symptoms has been their variability. Because patients with the same morphological properties may have different symptoms, physicians have often concluded that symptoms are too psychically subjective to merit scientific consideration. A second reason for ignoring symptoms has been their lack of a taxonomy. No formal system of classification has been available for dividing symptomatic patients into sub-

groups whose categories are consistent and reproducible.

The purpose of this article is to demonstrate that symptoms can be classified, that variations in symptoms often represent functional variations in the tumour rather than mere psychic reactions of the host, and that symptoms are an important index of biological behaviour, prognosis, and therapy of human cancers. The concepts will be illustrated by data obtained from surveys of large numbers of patients with cancers of the lung and of the rectum.

METHODS

(1) Classification of Symptoms

A disease (or pathological lesion) either does or does not produce symptoms in its human host, and the symptomatic host either reacts or does not react to the symptoms by seeking medical attention. These clinical humanistic aspects of a disease are the basis for classifying symptoms in a recently described system of clinical taxonomy^{2, 3}. The basic features of classification are the types of symptoms and the manner in which the diseased patient came to clinical detection.

A cancer can produce three main types of symptoms:

(a) *Primary symptoms*. These symptoms can be attributed to the tumour at its primary locus or to inflammation surrounding the tumour; none of the symptoms *per se* implies dissemination of the tumour. For example, in cancer of the lung, the primary symptoms would be: a recent cough; haemoptysis; chills, fever or sweats of an associated pneumonia; recent dyspnoea; or appropriate types of chest pain. In cancer of the rectum, the primary symptoms would be: bleeding; a significant recent change in stool appearance or in bowel habits; anorectal discomfort; or appropriate types of abdominal pain.

(b) *Systemic symptoms*. These symptoms arise as systemic effects remote from the primary site of the tumour, but the systemic symptom does not *per se* imply that the tumour has spread beyond that primary site. For example, anorexia, significant loss in weight and fatigue are systemic symptoms in cancer of either lung or rectum. The joint pains of hypertrophic pulmonary osteoarthropathy are systemic symptoms in cancer of the lung.

(c) *Metastatic symptoms*. These symptoms imply *per se* that the cancer has spread beyond its primary locus. For example, in cancer of the lung,

invasion of the mediastinum is implied by dysphagia, by hoarseness due to a non-moving vocal cord, or by the manifestations of the superior vena cava syndrome; dissemination of tumour beyond the thorax is implied by bone pain, by cutaneous nodules, or by neurological manifestations. In cancer of the rectum, metastatic symptoms would be bone pain, ascites, jaundice, or an unequivocally enlarged, nodular, hard liver.

(2) Attribution of Symptoms

Two main problems in the categorization of symptoms arise from decisions about the sources of symptoms. The first problem is the decision whether a particular symptom is due to the tumour or to some other disease that may co-exist in the same patient. For example, if a patient has both chronic emphysema and a cancer of the lung, should his recent dyspnoea be attributed to the emphysema, to the cancer, or to both? Our classification policy in these situations has been to attribute a symptom to the cancer when the symptom could not clearly be attributed to some other disease. For example, the symptom of visual difficulty in a patient with cancer might have been caused by an ocular or cerebral metastasis of the cancer. These neoplastic causes of visual difficulty could be excluded, however, if the patient had a cataract or some other local condition that was clearly the cause of the ocular symptoms. In making these 'attribution' decisions, we ascribed a symptom to some other cause if the other disease existed and seemed unequivocally responsible for the symptom. If a symptom could not be clearly excluded as definitely due to some cause other than the cancer, we included and classified that symptom among those attributable to the cancer.

A second type of problem is the decision whether certain symptoms attributable to the cancer should be regarded as primary or metastatic. For example, the symptomatic entity of pleuritic chest pain could arise from inflammation of pleura in a pneumonia secondary to the obstruction by the tumour of its primary bronchial site. Alternatively, the symptom might be due to neoplastic invasion of muscle, bone or pleura. In these situations, the symptoms are due to the cancer, and the problem is one of classification, rather than attribution. Any reasonable policy of categorization can be applied, so long as it is used consistently. Our policy has been to use the term 'metastatic', as defined earlier, for symptoms that were unequivocally associated with metastasis. When the symptom did not *per se* indicate metastasis, it was arbitrarily assigned to the 'primary' category for

these analyses. In more detailed analyses to be reported elsewhere at a later date, such symptoms have been further sub-divided according to the concomitant presence or absence of morphological evidence of metastasis.

(3) Spectral Combination of Symptoms

Of all the symptoms present in a particular patient, certain symptoms can thus be noted as attributable (or possibly attributable) to the cancer. Of those attributable (or possibly attributable) to the cancer, some symptoms will be classified as primary, some as systemic and others as metastatic.

At the time a patient is first discovered to have a cancer, he may have none, one, two or all three types of these symptoms. Because the symptoms can occur alone, or in various combinations, the Venn diagrams of symbolic logic and set theory are a convenient way of illustrating the different components of the symptomatic spectrum. In the population of patients with a cancer, the seven possible types of sub-sets with different combinations of symptoms are shown in the Venn diagram of Fig. 1, which represents the complete clinical spectrum of a diagnosed cancer. An additional sub-set is provided by the patients whose tumour is discovered by accident while the patient is still asymptomatic. The circumstances in which such asymptomatic accidental discoveries occur have been described elsewhere^{2, 3}. (The remainder of the 'universe' of cancer of the lung, beyond these eight sub-sets, contains patients in whom the disease is present but not diagnostically detected.)

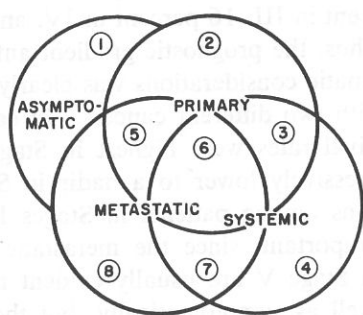


Fig. 1. The clinical spectrum of a diagnosed cancer. This Venn diagram shows the 'intersections' of sets of patients with primary, systemic, or metastatic symptoms, occurring alone or in the various illustrated combinations. The asymptomatic group—with none of these symptoms—is distinguished from the remainder of the 'universe' of patients whose cancer has not been diagnosed. The eight sub-groups (or sub-sets) are further described in the text.

(4) Prognostic Implications of Symptomatic Stages

Of the eight sub-sets of patients just described, the four with metastatic symptoms (sub-sets 5-8)

have a manifestly poor prognosis, because the presence of the metastatic symptoms indicates anatomic spread of the tumour beyond the primary site. In the remaining four sub-sets—who have no metastatic symptoms—the presence of systemic symptoms in sub-sets 3 and 4 suggests a situation less favourable than in the patients of sub-sets 1 and 2, who have neither metastatic nor systemic symptoms.

In sub-sets 1 and 2, whose symptoms *per se* have no unfavourable morphological or functional connotations, the duration of the symptoms can next be considered. For patients with primary symptoms only (sub-set 2), the duration of symptoms indicates a minimal time for the duration of the tumour—since the tumour has been present at least as long as its symptoms. If the symptoms are of short duration, no conclusion can be drawn about the rate of growth of the tumour. The symptoms may be short because the tumour has grown rapidly, or the tumour might have grown slowly with an eventual 'iceberg effect' in which symptoms did not appear until quite late in the course of the tumour. If the symptoms are of long duration, however, the tumour is likely to be slow-growing. The only way a patient could continue to have primary symptoms only, for a long time, without developing systemic or metastatic symptoms, would be to have a slow-growing tumour.

In the asymptomatic patients of sub-set 1, whose disease is discovered by accident during an examination performed routinely or for a complaint unrelated to the cancer, the duration of symptoms cannot be assessed since no symptoms exist. In such patients, the tumour has been present for unknown lengths of time and might have remained symptomatically silent for even longer lengths had the tumour not been accidentally discovered.

With these considerations, the eight sub-sets of Fig. 1 can be rearranged to create five main symptomatic groups or stages. In the new arrangement, which is shown in Fig. 2, sub-set 1 remains intact as the 'asymptomatic' group (Stage I). Sub-set 2 has been divided into two parts, according to whether the duration of symptoms was less than 6 months or at least 6 months: the 'long primary' group (Stage II) contains patients with primary symptoms only, of duration 6 months or more; and the 'short primary' group (Stage III) contains patients with primary symptoms only, of duration less than 6 months. Sub-sets 3 and 4 have been combined to form the systemic group (Stage IV), and sub-sets 5, 6, 7 and 8 have been combined to form the 'metastatic' group (Stage V).

From the foregoing discussion and from the hypothesis of "biologic predeterminism", we can anticipate a prognostic gradient among these five symptomatic states. The survival rates should be best in Stages I and II, declining through Stages III and IV to the worst results in Stage V. Yet these prognostic distinctions—particularly in Stages I-IV—would not be discernible from morphological data, and could be detected only from analysis of symptoms.

(5) Selection of Patients and Methods of Survey

The medical record files of both the Yale-New Haven and West Haven Veterans Administration Hospitals were searched for the names of all patients who had received the diagnosis of primary cancer of the lung or of the rectum during the years 1953-58. The latter boundary was selected to ensure at least a 5-year follow-up period for the survey, which began in 1963; the opening year coincided with the opening of the VA Hospital. The survey was restricted to patients in whom histological proof of the cancer had been obtained during life or after death. Patients with cancer of the lung had had various cellular types of tumour; in cancer of the rectum, the type was exclusively adenocarcinoma. Records of the individual patients were then reviewed by methods described elsewhere^{4, 5}.

For each patient, a complete chronology of the neoplastic illness was constructed, including all details pertinent to its earliest manifestations and extending for at least 5 years beyond the index date. For this chronology, additional data were obtained as needed from the Yale-New Haven Tumor Registry and from communication with patients, relatives, physicians and other hospitals. These investigations provided a complete description of the entire subsequent course, for at least 5 years beyond the index date, for each patient in this survey.

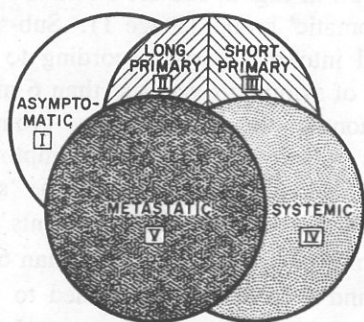


Fig. 2. Symptomatic stages of a cancer. The eight sub-sets of Fig. 1 are combined or divided to form the five mutually exclusive symptomatic stages shown here. For further details, see text.

The index date selected as a common 'zero time' for all patients was the date of the first treatment. The 'zero time' served as the point at which the clinical state of each patient was classified, and from which the antecedent duration of symptoms and other manifestations, and the subsequent duration of survival, could be measured. Treatment was defined as surgery originally intended to remove the primary tumour (regardless of whether the tumour was actually removed), or radiotherapy directed at the primary tumour, or the administration of a cytotoxic chemotherapeutic agent. Patients who received only analgesics, sedatives, antibiotics or therapeutic measures other than one or more of the procedures just cited were regarded as having received no treatment. For such patients, 'zero time' was the date on which the physician (or patient) had decided against specific anti-neoplastic therapy. In patients who died before any therapeutic decision could be made, 'zero time' was the date of diagnosis.

RESULTS

(1) Overall Survival

Fig. 3 shows the 5-year survival rates for all patients in this survey, regardless of mode of therapy. In the 596 patients with lung cancer, the total 5-year survival was 9 percent, but the rates ranged from 32 percent in symptomatic Stage I to 18 percent in II, 10 percent in III, 8 percent in IV, and 0.6 percent in V. In the 201 patients with cancer of the rectum, the total 5-year survival was 27 percent, with rates in the different symptomatic sub-groups ranging downward from 67 percent in Stage I, to 49 percent in II, 29 percent in III, 16 percent in IV, and 0 percent in V. Thus, the prognostic gradient anticipated from symptomatic considerations was clearly evident in patients with two different cancers. In each cancer, the survival rates were highest in Stage I and became progressively lower to a nadir in Stage V. The distinctions among patients in Stages I-IV are particularly important, since the metastatic aspects of patients in Stage V are usually evident morphologically as well as symptomatically, but the differences among Stages I-IV can be discerned only from symptoms.

For simplicity in the subsequent statistical analyses presented here, we have combined the results of Stages I and II, and of Stages III and IV, thus reducing to two categories the four symptomatic sub-groups of Stages I-IV. With these consolidations, the survival rate in cancer of the lung was 22 percent (28/127) for Stages I and II and 9 percent

(27/300) for Stages III and IV [$X^2 = 12.4$; $P < 0.001$]. In a similar comparison for the combined symptomatic sub-groups of cancer of the rectum, the rates are 50 percent (31/62) in Stages I and II as compared with 19 percent (24/124) in Stages III and IV [$X^2 = 17.2$; $P < 0.001$]. Both differences are highly significant statistically.

(2) Five-year Survival after Surgical Resection

Table 1 shows the five-year survival rates for patients whose tumours were surgically resected. The patients are classified according to the conventional notation of regional lymph node involvement, and are simultaneously categorized by symptomatic stages. The prognostic gradient previously noted for Stages I and II compared with Stages III and IV is still significantly present after surgery. The 5-year survival rate in these two symptomatic categories after resection of lung cancer was 37 percent compared with 22 percent [$X^2 = 4.6$; $P < 0.05$]; for rectal cancer, the corresponding data were 55 percent compared with 28 percent [$X^2 = 9.3$; $P < 0.01$].

In each of the two lymph node categories for each of the two tumours, the patients in symptomatic Stages I and II had better survival results than those in Stages III and IV. Although most of the numerical values in these sub-categories are too small for statistical significance, a significant distinction is present in the group with rectal cancer and 'negative nodes'. In patients of this morphological category, the 5-year survival was 68 percent in symptomatic Stages I and II, and 40 percent in Stages III and IV. This difference is significant at $P < 0.05$ [$X^2 = 5.2$].

(3) 5-year Survival and Cellular Type in Lung Cancer

All the rectal cancers in this survey were adenocarcinomata. The cancers of the lung, however, had various cellular types. Table 2 shows the 5-year survival rates according to the symptomatic stage and cytological differentiation of the tumours. As expected, the survival rates were better in well-differentiated than in not-well-differentiated tumours. For the total series, regardless of therapy, the cellular distinction in survival rate was 14 percent compared

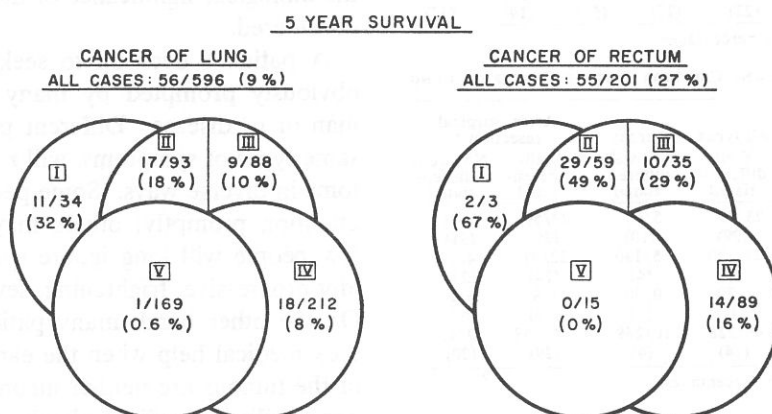


Fig. 3. Five-year survival, regardless of therapy, for the symptomatic sub-groups shown in Fig. 2. Denominators represent the number of patients initially in each symptomatic stage, and numerators are the number who survived 5 years or more after therapeutic decisions. Although the rates for cancer of the rectum are consistently higher than those for cancer of the lung, the same descending prognostic gradient is present from symptomatic Stages I-V for both cancers.

As expected, the patients without neoplastic involvement of regional lymph nodes had better results than those whose nodes contained tumour. In the total results for cancer of the rectum, the patients with 'negative nodes' had a survival rate of 51 percent, compared with 19 percent in those with 'positive nodes'. This difference is statistically significant at $P < 0.001$ [$X^2 = 15.0$]. The corresponding values in lung cancer were 31 percent and 22 percent—a difference of uncertain significance [$X^2 = 1.9$; $P > 0.2$].

with 4 percent—a highly significant difference [$X^2 = 17.1$; $P < 0.001$]. Within the same cytological categories, however, patients in Stages I and II had higher survival rates than those in Stages III and IV. In the well-differentiated group, the two comparative percentages—29 percent and 13 percent—were significantly distinct at $P < 0.01$ [$X^2 = 8.5$].

In patients whose tumours were surgically resected, the survival rate for the well-differentiated tumours, 29 percent, was not significantly higher than the 20 percent found with undifferentiated tumours

[$X^2 = 1.0$; $P > 0.3$]. Yet, in each cellular category, the results of patients in Stages I and II were similar, and higher than those of patients in Stages III and IV. The differences in postoperative survival between these two symptomatic categories—regardless of cellular type—were previously noted in Table 1 to be statistically significant at $P < 0.05$. Consequently, as a harbinger of postoperative prognosis in cancer of the lung, the symptomatic stage distinctions were more significant than the cytological appearance of the tumours, and also, as noted earlier, than the invasion or non-invasion of lymph nodes.

Table 1. FIVE-YEAR SURVIVAL AFTER SURGICAL RESECTION OF CANCERS OF LUNG OR RECTUM

Symptomatic stages	Cancer of lung *			Cancer of rectum *		
	Regional lymph nodes negative for tumour	Regional lymph nodes positive for tumour	Total	Regional lymph nodes negative for tumour	Regional lymph nodes positive for tumour	Total
I and II; (asymptomatic and long primary)	21/51 (41)	7/24 (29)	28/75 (37)	23/34 (68)	7/21 (33)	30/55 (55)
III and IV; (short primary and systemic)	15/60 (25)	11/58 (19)	26/118 (22)	19/48 (40)	5/39 (13)	24/87 (28)
V; (metastatic)	0/4 (0)	1/6 (17)	1/10 (10)	—	0/4 (0)	0/4 (0)
Total	36/115 (31)	19/88 (22)	55/203 (27)	42/82 (51)	12/64 (19)	54/146 (37)

* Values in parentheses are percentages.

Table 2. FIVE-YEAR SURVIVAL AND CELLULAR TYPE OF CANCER OF LUNG

Symptomatic stages	All types of therapy *		After surgical resection *	
	Well-differentiated	Not well-differentiated	Well-differentiated	Not well-differentiated
I and II; (asymptomatic and long primary)	23/79 (29)	5/48 (10)	23/59 (39)	5/16 (31)
III and IV; (short primary and systemic)	22/170 (13)	5/130 (4)	22/91 (24)	4/17 (24)
V; (metastatic)	1/79 (1)	0/90 (0)	1/8 (13)	0/2 (0)
Total	46/328 (14)	10/268 (4)	46/158 (29)	9/45 (20)

* Values in parentheses are percentages.

DISCUSSION

These results confirm the expectations of traditional clinical logic that have not previously been possible to demonstrate because the symptomatic components of clinical reasoning had not been given a formal structure that would permit quantified analysis. With the aid of Venn diagrams, the identified symptomatic ingredients can be arranged into a distinctive and suitable 'taxonomy'.

It is apparent from the data that symptoms indicate aspects of the function and rate of growth of a cancer that cannot be discerned morphologically. Conversely, the morphological properties of a cancer denote anatomical features of growth that cannot be discerned from symptomatology. To understand the biological behaviour of a tumour, and to appraise its

prognosis and therapy effectively, both the morphological and symptomatic features must be appropriately classified and analysed.

That patients with a long duration of symptoms often have a paradoxically good prognosis, despite 'late' treatment, has been repetitively noted in many therapeutic surveys of cancer. Among the most recent reports have been the results cited for Hodgkin's disease and for cancer of the stomach⁶⁻⁸. Although the existence of a good prognosis for many such patients prompted MacDonald¹ to form his hypothesis of "biologic predeterminism", the hypothesis has seldom been adequately tested and has hitherto remained generally unconfirmed. In many surveys, the significance of the duration of certain distinctive symptoms has been obliterated because the investigators calculated duration as an average for all types of symptoms, instead of restricting the delineation to patients with primary symptoms only. In other investigations the data demonstrating paradoxically good prognosis for many patients discovered after a long 'delay' were usually dismissed as isolated peculiarities of the behaviour of cancer and man, and the biological significance of the data was not further considered.

A patient's decision to seek medical attention is obviously prompted by many different features of man or of disease. Different people, developing the same types of symptoms, will respond to those symptoms in diverse ways. Some people will seek medical attention promptly; others may wait. Nevertheless, few people will long ignore symptoms that are rapidly progressive, frightening, severe or incapacitating. On the other hand, many patients may not rapidly seek medical help when the early primary symptoms of the tumour are neither inconveniencing, dramatic, nor debilitating. Since slowly growing tumours produce symptoms slowly, such patients are often not motivated to visit a doctor until later in the illness when more significant symptoms have developed. In this way, many 'favourable' tumours are not detected until a long duration of symptoms has elapsed. If the tumour is discovered by accident before it has produced any symptoms, it has an even greater likelihood of being slow-growing.

This morphologic-functional interaction of tumour and host in human cancer has several other important implications:

(1) In selecting treatment for individual patients, physicians should not rely on morphology alone. A slow-growing tumour may be resectable for 'cure' even though it invades lymph nodes and is attached to contiguous structures. In many patients of the

series surveyed here such tumours, left unresected because these features made the tumours seem 'inoperable', eventually caused death not by subsequent widespread metastases but by their effects as 'foreign bodies' in the chest or abdomen. Death often resulted from a lung abscess that developed behind the intact tumour, from uraemia due to the compression of ureters by the tumour, or from massive haemorrhage as the tumour later invaded a blood vessel. Conversely, other patients with tumours that were clearly of rapid and unfavourable progression were subjected to fruitless operations and other therapy that increased the agony of the illness without affecting survival.

(2) In the design of therapeutic trials, the clinical population should be stratified according to symptomatic as well as morphological stages. Otherwise the base populations will not be reproducible, and the results will contain inconsistencies that will add to controversy and dilemma in statistics of cancer therapy⁹. Suppose, for example, that two treatments A and B are equally ineffective, but that treatment A is given to a population consisting predominantly of patients from symptomatic Stages I and II, while the population receiving treatment B consists mainly of patients from symptomatic Stages III and IV. If the patients have not been stratified for these symptomatic distinctions, the investigators will be unaware of these deceptive differences in two groups of patients that seem the same because they are morphologically similar. When treatment A is followed by results that are significantly better than those of treatment B, the difference may be erroneously ascribed to the treatment instead of to the disease.

(3) In the research at present devoted to the aetiology and pathogenesis of cancer, investigators

may apply many biochemical, immunological, chromosomal and other tests to human neoplastic tissue. The results may show a wide range of variation that appears to have no particular correlation with the morphology of the tumour. Yet, if the neoplasms were categorized by function as well as by form, many of the apparent 'discrepancies' might be explained. Laboratory research at present dismissed as valueless might actually provide important new revelations if the neoplasms were more clearly and specifically defined for correlation.

The complexity of man increases the difficulty of studying human disease, but also enables a diseased man to talk. His description of his symptoms gives crucial information about function of the diseased structures under investigation.

This work was supported in part by a grant, CA07155, from the National Cancer Institute. I thank Joyce A. Pritchett, Helen L. Bidwell, Carol R. Schimpff, Lorraine MacI. Phillips and H. Teresa Hatch for technical assistance. Dr. Edgar W. Hull collaborated in obtaining some of the data dealing with cancer of the rectum. I also thank all the physicians, hospitals, tumour registries and medical record librarians who provided additional data to help complete the chronological information about many of the patients under survey.

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EMPIRICISM AND RATIONALITY IN DUODENAL ULCER SURGERY: THE CHANGING EMPHASIS

John R. Brooks MD FACS* and Francis D. Moore MD FACS**. *Surg Clin N Amer* 46(2): 235-244, April 1966.

When William Beaumont first inserted a piece of meat on a string in the stomach of Alexis St. Martin, and noted its rapid digestion, he provided a uniquely American basis for all that has been rational in ulcer

surgery: attempts to reduce the acid-peptic potential of gastric secretion, to measure the results, and to equate these measurements empirically with the clinical well-being of the patient. Despite this early scientific observation in the Wisconsin wilds, much of duodenal ulcer surgery for the subsequent century was developed in Europe, and was based on the most pragmatic sort of empiricism: something surgical

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was done to the stomach and then, after many hundreds of cases, one might view the damage to see if anything good had been achieved. More recently, the pendulum has swung back to this country, particularly through the exploitation of vagotomy as a treatment for duodenal ulcer, and the exploration of the role of the antral mucous membrane in the acid-peptic potential of the stomach; these advances, together with the description of endocrine tumors that characteristically are associated with the production of duodenal ulcer disease, have marked a major victory for physiological rationality, and a return to sound surgical science in the ulcer field. But even now, with such advances behind us, we still must examine the results in significant numbers of cases over a significant lapse of time if we are to improve the records, as we are dealing with a benign disease of lifelong duration and of unknown cause.

Although difficult to prove, there is suggestive evidence that acid-peptic ulceration of the proximal duodenum is a disease of relatively recent emergence. Or, rather, it may be a by-product of our certain type of urban civilization which, as it overpopulates the earth, likewise overpopulates hospitals with this particular disease. Of corollary importance in viewing any history of duodenal ulcer surgery is the fact that the diagnosis cannot be established in the living save by the use of the roentgen ray; even when viewed at operation as a perforation or obstruction, the precise nature of the pathology is often difficult to discern. It is not surprising, therefore, that the first significant mention of benign duodenal ulcer as an important medical problem coincides with the turn of the century, Dr. Röntgen's ray, and the development of anastomotic surgery of the gastrointestinal tract.

Obstruction of the distal stomach and proximal duodenum is anatomically best treated by short-circuiting the stomach to the high jejunum. Thus gastrojejunostomy, performed first for malignant obstruction, became almost by accident the first operation for duodenal ulcer. In those patients in whom the obstruction was malignant, the lack of acid obviated any local postoperative complications, and advance of the disease produced an early death. In those in whom it was due to benign ulcer disease, the re-establishment of gastrointestinal continuity and food-taking was so spectacular that the operation soon became widely used as an empirical procedure for any kind of duodenal ulcer complication, whether obstruction or not.

The concept of this operation for duodenal ulcer

was unphysiological; but this was not appreciated at the time.

The balance between empiricism and rationality was illustrated even here at the very start of ulcer surgery: first used as an empirical bypass procedure to obviate obstruction, a rationale was soon found for gastrojejunostomy because the high acid gastric juice would now be "neutralized" by the alkaline juices of the duodenum and high jejunum. This "battle of the pH" was fought in the upper gastrointestinal tract of many unsuspecting patients between 1900 and 1935. Both in Europe, and in the large private clinics of this country, where specialization was quickly achieved, many hundreds or thousands of patients were so dealt with before two facts became evident. First, that if no obstruction was present and the acid-peptic diathesis was very active, the jejunum lost the battle, and it was acidified, rather than the stomach becoming neutralized. The result was a recurrent or jejunal ulcer, estimated in some series to occur in as high as 50 percent of cases, and often occurring very late after the initial anastomosis (up to 25 years intervening in some instances). Second—and only recently appreciated—evidence began to appear that the pH of the intraluminal contents of the stomach represents a delicate homeostatic balance of forces. When alkali of any sort is introduced (whether by mouth or through the stoma of gastrojejunal anastomosis), the acidity regulation of the stomach secretion is challenged and responds by the outpouring of a greatly increased amount of acid. But more of this delicate response of the antrum later.

As a result of the failure of gastrojejunostomy, about 1910, surgeons in the German and Austrian clinics began to explore gastrectomy for ulcer. Here again, an operation used for cancer (even though the stomach's removal was rarely availing) was transferred over to the ulcer problem. Finsterer and Bilioth were early motivators in this field, and there was a considerable time lag before such Americans as Berg at Mt. Sinai and the Mayo brothers in Minnesota succeeded in popularizing the procedure in America.

Between 1925 and 1950 subtotal gastrectomy was by all odds the most common operation for the complications of duodenal ulcer disease. Physiologically it had shortcomings. It did not remove the major acid-producing portion of the stomach (fundus and body) wherein lie parietal cells capable of producing a secretion high in chloride concentration and low in pH. It did remove the antrum where by contrast no

parietal cells exist and the chloride concentration is lower and the pH higher. Although Edkins had done his classic work on the antrum and emphasized the "hormonal" aspect of gastric secretion, it was not until well into the era of subtotal gastrectomy that it became clear that subtotal gastrectomy's effect was probably primarily as much that of antral removal as it was that of removing some of the parietal cells in the central portion of the stomach, but little was understood at that time concerning the role of the antrum in acid production as it is understood today. Thus distal gastrectomy turned out happily to have a serendipitously physiological rationale when the average surgeon presumed that in doing the gastrectomy he was removing acid-bearing tissue. Because the highest concentration of parietal cells lie in the body and upper part of the stomach, logical rationale might well have guided the surgeon into doing proximal gastrectomy for duodenal ulcer. And as time went on, many surgeons increased their gastrectomies proximally, removing 75 and 85 percent of the stomach in their enthusiasm to eradicate completely all source of acid. The concept of end-organ ablation was uppermost in the mind of surgeons and the more sophisticated physiological concepts of acid origin and its stimulus were only vaguely understood.

These 25 years of ablative gastric surgery produced many reports. The study from Columbia University by Harvey and co-workers stands as a prototype for many others. A 4 to 8 percent ulcer recurrence rate persisted, and as the resulting enthusiasm on the part of surgeons to increase the extent of gastrectomy prevailed, it became apparent that more and more patients were suffering from the by-products of excessive gastrectomy. Surgeons could well point to the fact that in capable hands the mortality of gastrectomy was only 2 to 4 percent, but what was not as well known were the unfortunate results of this form of surgery for duodenal ulcer disease in the country and world at large. In less adept hands the complications of duodenal stump blowout, of postoperative pancreatitis and of postoperative bleeding increased the mortality beyond reason for this benign disease. In many patients the very significant degree of "dumping symptoms" led to distressing weight loss, nutritional problems, and other debilitating conditions.

By the late 1940's it was clear to most that, although results in ulcer surgery employing subtotal gastrectomy were good in most cases, there was a surprisingly high percentage of patients who did not

fare so well nutritionally, and this was due in large part to the absence of the reservoir function of the stomach. In hope of cutting down the mortality that emanated from dissection around the duodenum, and in hope of minimizing nutritional problems, surgeons introduced sleeve resections, fundisectomy and other procedures short of subtotal gastrectomy, hoping to remove acid-bearing portions of the stomach but avoid the technical problems around the duodenum. When the Billroth I gastroduodenostomy reconstruction following subtotal gastrectomy was reintroduced, Harkins and others found rational support for it in that it allowed gastric contents to pass physiologically across the duodenal loop where food and acid could normally stimulate bile and pancreatic juice flow. Some reported that nutrition was better and "dumping symptoms" less severe. Others pointed to a high ulcer recurrence rate. Others argued that any type of reconstruction was likely to produce unhappy by-products in a significant percentage of cases and particularly in the thin, asthenic, "emotional" patient. Gastrectomy of any type appeared to be associated with abnormal fat loss in the stool and an increased intestinal transit time. Both of these made postoperative weight maintenance difficult.

When a large, dry meal is ingested, the stomach is exposed to an extremely hypertonic medium for several hours. In addition, the digestion of protein, starch and fat breaks the large molecules down into smaller ones, and greatly increases the osmotic strength or hygroscopic water-holding power of the meal. Despite this, the stomach prevents the patient from having an osmotic fluid loss, compromising plasma volume. The gastric mucous membrane expends energy to maintain acid-base equilibrium within its lumen, and likewise to prevent the osmotic loss of water into the lumen. The stomach might, therefore, be referred to as an "osmotic shield," protecting the patient from the osmotic consequences of a meal. By the time this meal has been digested and is discharged only in small portions into the duodenum and upper jejunum, the osmotic effect is only gradually evident, and only after excessively large meals does the normal subject experience the sense of faintness which, greatly exaggerated, becomes the "dumping syndrome."

This "dumping syndrome" arises in part from the infusion of a large osmotically active load of food, particularly carbohydrate, into the upper jejunum.

The upper jejunum does not shield the body from this osmotic challenge; a large amount of water is immediately lost in the jejunum, plasma volume is compromised and, in those subjects with some autonomic instability, there is a feeling of faintness which sometimes may go on to the full autonomic consequences of the "dumping syndrome," including bradycardia, flushing and asthmatic wheezing. It is significant, therefore, that operations which leave more of the stomach in place and intact maintain this osmotic shielding function of the stomach, thereby minimizing the patient's discomfort.

In 1944, McKittrick, Moore and Warren reviewed a series of patients undergoing subtotal gastrectomy at the Massachusetts General Hospital. The purpose of the review was to discern the cause of death in those few who died. Fatality was shown to be traceable to difficulties at the duodenal stump turn-in in the vast majority of cases. For this reason, a two-stage operation was proposed in which, for those patients with an extensively inflamed duodenum, the inflammatory mass in the antrum was left in place, and the proximal gastrectomy with anastomosis was done for the first stage; then, a few weeks later, inflammation having subsided, the duodenum was removed. In conjunction with this operation, the authors emphasized the importance of removing the antral mucous membrane. They called attention to the early work of Edkins, showing that the antrum produces secretion stimulating gastric-acid formation; and they reported for the first time a series of patients in whom the antrum had not been removed in exclusion operations (most of these done previously and with no intent of removing the antrum) in whom very intractable jejunal ulcers had formed. The important point about this small group of patients with the "antral syndrome" lay in the fact that the recurrent jejunal ulcer was completely cured by removal of the antrum even though nothing else was done. In the two-stage gastrectomy, as proposed by McKittrick, only one patient developed a jejunal ulcer, and this because intervening systemic disease prevented the timely removal of the antrum. Whatever other importance one may attach to the two-stage gastrectomy, here for the first time was evidence in man that the antral mucous membrane played a unique role in ulcer surgery.

We owe to Dragstedt and his laboratory the data which gave us a clearer understanding of the physi-

ology of the antrum and its relationship to gastric acid secretion. Likewise from Dragstedt's laboratory came the first mention of vagotomy for duodenal ulcer, to be considered as a modern and rational approach to ulcer surgery. Although vagotomy for duodenal ulcer had previously been mentioned by Latarjet and later Pieri, their reports were inconclusive; the concept was far ahead of its time, and the method was not accepted.

In the late 1940's pure vagotomy was reinstituted in clinical practice, but it was not long before it was apparent that the hypomotility produced by vagotomy led to poor stomach emptying and, secondarily, to antral stasis. Hereby the stage was set for ulcer recurrence. Even though vagotomy decreased gastric acidity to a low level, the parietal cell was still capable of responding to extravagal stimuli, and antral stasis, a by-product of the vagotomy, was one of these. In fact, the rate of ulcer recurrence following pure supradiaphragmatic vagotomy in Moore's series of 150 patients was 14 percent. Dragstedt theorized that duodenal ulcer disease was in many instances a function of excess vagal tone and that gastric ulcer disease was a function of antral stimulation. Patients undergoing pure vagotomy who later had ulcer recurrence often developed a new ulcer on the lesser curvature of the stomach. For a number of reasons then, it was apparent that simple vagotomy did not solve the problem of duodenal ulcer disease.

The 1950's saw attempts at combining subdiaphragmatic vagotomy with the gastrojejunostomy of earlier ulcer surgery days. Dragstedt popularized this procedure and when the recurrence rate following a proper vagotomy appeared to be higher than he wished he pointed out the importance of a properly placed enterostomy in order completely to drain the antrum and prevent stasis within it. Grimson, Hoerr and also others reported satisfaction at first with vagotomy and posterior gastroenterostomy.

By the end of the 1950's, however, many surgeons were abandoning this procedure because of ulcer recurrence and moving in the direction of a lesser gastrectomy (40 to 50 percent) combined with vagotomy, thereby hoping to lower gastric acidity further and minimize the postoperative nutritional difficulties by doing a smaller gastrectomy. Colp, Zollinger and Herrington among many others reported successful series of cases. Smithwick and Farmer's careful clinical studies on their patients showed clearly that the secretory potential of the stomach was lowered more by this combined proce-

dures than any other. The recurrence rate was low and in their hands the mortality rate was acceptable.

Then it became apparent that the complications of vagotomy (gastric stasis, intestinal hypermotility, increased bacterial flora, etc.) were compounded when combined with the defects of subtotal gastrectomy (loss of reservoir function, "dumping symptoms" and nutritional defects). Physiologically, removing the antrum and severing the vagus nerves had a high order of rationality. However, the complications stemming from surgical dissection around the duodenum still persisted. Postoperative pancreatitis and duodenal stump blowout were still significant complications.

By the late 1950's, there was increasing dissatisfaction with subtotal gastrectomy as an operation for duodenal ulcer. Although such ulcer surgery was relatively successful, still duodenal ulcer is a benign disease and mortality was still a significant factor following surgery for its complications. There were those at this time who advocated selecting the operation to fit the patient, employing vagotomy and gastrojejunostomy for the thin or debilitated patient or the technically difficult edematous duodenal ulcer, and reserving subtotal gastrectomy for the high acid, robust, ulcer patient type.

While the data from the "antral syndrome" in man had indicated that the defunctioned or turned-in antrum was a more potent stimulus to gastric acid secretion than the antrum left in continuity, most of Dragstedt's work had concentrated on factors which stimulate antral hormone production. It remained for Harrison, Lakey and Hyde and others to show quite clearly that the antrum, like so many other balanced physiological mechanisms in the body, can produce both inhibition and stimulation of the gastric parietal cell. If the intraluminal pH of the gastric antrum is low, indicating that maximum acid production has occurred, there is then some inhibition of parietal cell function to allow the stomach to return to an acidity in mid-range (about pH 5). By contrast, if the intraluminal pH in the antrum is very high, alkali or food having been added, then there is a strong stimulus to the production of gastric acid. Indeed, these findings help to explain, in part, not only the antral syndrome in the defunctioned cases, but likewise the adverse effects of oral alkali, and of gastrojejunostomy, as regards volume of gastric secretion.

In any event it has become clear that the gastric antrum in continuity, exposed to and washed over by gastric acid, is more likely to spend many hours in the resting or inhibitory phase than an antrum which

is defunctioned, or exposed to jejunal reflux. It is for this reason that pyloroplasty, which leaves the antrum exposed to gastric acid (even though this be acidity in the range of pH 3-5, as is characteristic after vagotomy) is far preferable to gastrojejunostomy for gastric drainage after vagotomy. In the latter connection, it should be emphasized that, in acute experiments, it is very difficult to observe any effect whatsoever of vagotomy on the antral-parietal-endocrine relation.

Evidence was forthcoming that the vagotomized stomach could still respond to various circulating substances (for example, histamine). Gray emphasized the importance of adrenal cortical hormones in producing gastric secretion. Ellison and Zollinger pointed out the important relationship between the pancreas and gastric hypersecretion; and others advanced the theory that other endocrine glands (parathyroid and pituitary) had roles in regulating gastric secretion. While physiologists and surgeons were working in the laboratory trying to evaluate the effects of other peripheral organs in the body upon gastric secretion, there was a growing conviction that some surgical procedure for duodenal ulcer was needed in which the antrum and body of the stomach could be left relatively unchanged.

Pyloroplasty had been considered by Finney and others for obstructing duodenal ulcer disease. The concept of improving gastric drainage by opening the gastric outlet had a sound physiological basis. Weinberg introduced pyloroplasty following vagotomy in the late 1950's. Here at one time was a rational physiological procedure which was not ablative; the antrum remained in situ to respond to pH stimuli and the stomach maintained its reservoir function. Its popularity soon grew. Postvagotomy alkaline stasis in the antrum could be obviated by pyloroplasty. More than this, the hazards of circumferential dissection of the duodenum in an area of edema and inflammation were obviated, the dissection being made in the more normal anterior portion of the stomach. Would the operation stand the test of ulcer recurrence any better than vagotomy and posterior gastroenterostomy? By the early 1960's enough data were forthcoming to suggest that ulcer recurrence would not be excessive and as a result the procedure gained even more popularity.

The results following gastrectomy for bleeding duodenal ulcer remained poor. Such patients, frequently elderly and often suffering from chronic pulmonary insufficiency, made up the bulk of mortality from ulcer disease. A mortality of less than 1

percent following elective subtotal gastrectomy rose to 25 percent or higher when gastrectomy was carried out as an emergency procedure for bleeding. By the mid-1960's came reports of experience with pyloroplasty and vagotomy combined with vessel suture for bleeding duodenal ulcer. In this large group of fragile patients there was a significant opportunity for improving mortality statistics. Pulmonary cripples with cardiac and renal decompensation in their 70's and 80's with bleeding duodenal ulcer could be operated upon more quickly and more safely; and the recurrence of bleeding appeared to be minimal. Although too soon to be categorically accepted, it appears that the procedure may well play a very important role in lowering the mortality of bleeding ulcer disease.

Subtotal gastrectomy will continue to remain the procedure of choice for tumors of the stomach and for most gastric ulcers as well, but as time goes by, more and more surgeons will surely resort to the simpler procedure of vagotomy and pyloroplasty (with temporary catheter gastrostomy) for all the complications of duodenal ulcer disease. Although the stocky, vigorous and overweight individual will continue to do beautifully following standard sub-

total gastrectomy for his duodenal ulcer disease, the vast majority of patients, thin, asthenic or elderly, and nutritionally below normal with duodenal ulcer disease will do better with a nonablative procedure.

Ulcer surgery, although more sophisticated today, is by necessity still directed at the end organ since the etiology of the disease is not as yet known. Nevertheless, progress in surgery for this disease has been made in the proper physiological direction. The operation of vagotomy and pyloroplasty has been developed as a result of increasing scientific rationale in ulcer surgery and is a by-product of sound growth in the understanding of the mechanisms of human digestion. Surely in the future, this procedure, likewise, will yield to further improvement. In any case, the surgeon will always have to look back over his own results and apply the time-honored measure of empiricism, such limitation being intrinsic so long as we have nothing other than the patient's own well-being and social usefulness to use as a gauge of the effectiveness of our operation.

(The references may be seen in the original article.)

The April 1966 issue of *The Surgical Clinics of North America* (Vol. 46) includes several discussions of some phase of peptic ulceration—all are recommended reading.—Editor.

WHAT CONSTITUTES AN ADEQUATE OPERATION FOR CARCINOMA OF THE THYROID?

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American Medical Association.*

Intensive clinicopathologic studies conducted at our institution over the past 14 years have convinced us that total thyroidectomy, with or without neck dissection, constitutes an adequate procedure for cancer of the thyroid. These studies represent the collaborative efforts of our departments of surgery, medicine, and pathology in a multidisciplinary approach to this disease problem.

Before the use of iodine 131 for diagnosis and therapy in cancer of the thyroid was established, our surgical staff was generally agreed that thyroid lobectomy with or without radical neck dissection was the surgical treatment of choice. We performed total thyroidectomy only in cases with obvious wide-

spread involvement of the gland or in detectable bilateral disease.

Beginning in 1950, following the development of our routine use of iodine 131, we started performing a number of total thyroidectomies *primarily* to gain better metabolic control of the patient through increasing physiologic demands on the remaining thyroid tissue and, *secondarily*, to decrease the dosage necessary for therapeutic effect. Histologic examination of whole glands from these patients showed a significantly high incidence of cancer in the contralateral lobe. This finding led to a comprehensive reevaluation of our pathologic and surgical techniques in an attempt to establish logical therapeutic parameters.

The refinement of the technique of whole-gland sectioning for histologic examination afforded us a unique opportunity to study the mode, pattern,

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and incidence of intraglandular distribution of thyroid carcinoma. One study of thyroid carcinoma based on whole-organ sections of 80 glands, reported in 1963,¹ revealed disquieting evidence of the transition of papillary and follicular carcinoma to the spindle and giant cell types in the glands of two patients, as well as in four glands removed at autopsy. This whole-organ study further demonstrated that in 70 patients (or 87.5%) the tumors extended either into the isthmus, the opposite lobe, the pericapsular lymph nodes of the opposite lobe, or two, or all three of these structures. Thus, removal of the lobe containing the primary would not have eradicated the carcinoma in the remaining glandular tissue or the pericapsular lymph nodes of the opposite side. In addition, this study demonstrated no relationship between adenomas and any of the carcinomas; that the incidence of venous invasion was negligible, thus negating this as a diagnostic criterion; and, that thyroid cancer metastasizes from the primary site to all parts of the gland through the intraglandular lymphatics.

In a second study, which was a follow-up on 116 patients on whom unilateral lobectomy had been performed, disease was demonstrated in the contralateral lobe of 41 patients (or 35%).² Most of the patients in this study had been operated on elsewhere and were referred for consultation, follow-up study, and future care. Thirty-four unselected patients in this series had immediate prophylactic resections of the remaining lobe; cancer was found in 21 of the 34 patients (or 67%). Thyroid cancer was found in the contralateral lobe of 20 additional patients who were operated on for clinical recurrence.

In a recently completed autopsy study of 42 primary thyroid cancers, pure papillary cancer of the thyroid was present in eight glands. The incidence of other histologic types in this series was: pure follicular, 4; Hurthle cell, 1; solid, 12; mixed papillary and follicular, 4; and spindle and giant cell, 13. The most significant finding was that in *all* 13 patients in whom spindle and giant cell cancer was the cause of death, papillary cancer, follicular cancer, or both, were *also* present.³

During the period from September 1944 through December 1963, we performed total thyroidectomies on 218 patients. In 78 of these patients unilateral radical neck dissection was also performed; in a few patients more extensive procedures were performed, including bilateral radical neck dissections in 13 patients (in one of whom an upper mediastinal dissection was also performed) and five patients on whom laryngectomies were performed (Table 1).

In 142 (of 218) patients the operation was considered *primary* because it immediately followed biopsy and frozen section diagnosis in our institution or was preceded by a diagnosis established elsewhere by means of small biopsy of the gland or by excision of a cervical node. In the remaining 76 patients the operation was considered *secondary* because it had been preceded by lobectomy, total or subtotal, or by subtotal thyroidectomy which in the opinion of the original surgeon was considered to have been a definitive operation.

In the *primary* group 80 (of 142) surgical specimens were studied by whole-organ subserial sections. Sixty-four of the 80 specimens, or 80%, con-

Table 1.—Treatment in Addition to Total Thyroidectomy

	Primary	Secondary	Total
Unilateral radical neck dissection	62	16	78
Bilateral radical neck dissection (1 with mediastinal dissection also)	13	..	13
Radical neck dissection on the right side and modified neck dissection on the left side	3	..	3
Unilateral modified neck dissection	2	4	6
Bilateral modified neck dissection	..	1	1
Unilateral block dissection of the neck	..	1	1
Total	80	22	102
Laryngectomy	2	..	2
Laryngectomy and unilateral radical neck dissection	3	..	3
Total	5	..	5

tained disseminated cancer from the lobe of origin to other areas of the gland or to the pericapsular lymph nodes on the contralateral side. In the remaining 62 glands in this group, examined by routine methods, the incidence of dissemination was 37.1% (23/62) (Table 2).

Table 2.—Dissemination in 142 Primary Cases

	No.	%
Routine pathological procedure, bilateral	23/62	37.1
Whole organ studies, bilateral	64/80	80.0
Total	87/142	61.3

The findings in specimens from the 76 patients whose operations were *secondary* were perhaps even more significant. Of the 54 specimens studied by routine methods, residual carcinoma was found in 20 (or 37%), whereas of the 22 studied by whole-gland subserial sections 16 (or 72.7%) contained residual cancer (Table 3). The overall incidence of residual cancer in the total study population of 218 patients, regardless of method of study, was 123 (of 218) or 56.4% (Table 4).

From these findings, it is apparent that complete removal of the primary thyroid tumor or tumors is best ensured by total ablation of the gland. Additional advantages are that total thyroidectomy prevents further dissemination, facilitates radioiodine studies for early detection of residual or recurrent thyroid cancer, facilitates iodine 131 therapy in the subsequent treatment of the patient, and may possibly prevent transformation of a differentiated form of carcinoma to an anaplastic type.

Table 3.—Dissemination in 76 Secondary Cases

	No.	%
Routine pathological procedure, bilateral	20/54	37.0
Whole organ studies, bilateral	16/22	72.7
Total	36/76	47.4

Table 4.—Dissemination Summary—218 Cases

	No.	%
Whole organ studies, bilateral	80/102	78.4
Routine pathological procedure, bilateral	43/116	37.1
Total	123/218	56.4

Surgical Procedure

Total thyroidectomy, including the pericapsular nodes and areolar tissue, should be performed in early disease before nodal involvement.

Total thyroidectomy and a "compartmental" dissection are performed when positive nodes are apparent *only* along the recurrent nerve. In this procedure dissection is carried between the two carotid sheaths from the suprasternal notch to the upper limits of the thyroid cartilage.

Total thyroidectomy and radical neck dissection are performed when other metastatic nodes are present. Enlarged contralateral nodes should be removed in continuity with superficial and deep areolar tissue and fascia.

If the larynx and trachea are invaded, they should be removed along with the total thyroid and possible radical neck dissection. If the infiltration of these organs is superficial, they may be spared and treated with subsequent extensive radioiodine therapy. If metastatic radioiodine uptake is poor, external irradiation may be used.

In cases where there is distant metastases to bone or lung tissue, total thyroidectomy should be done to reduce continued seeding by the primary, to prevent tracheal or vascular obstruction, and to enhance¹³¹ I therapy.

Lobectomies are performed *only* for frozen-section biopsy when the area of involvement is sufficient to warrant more than a simple wedge biopsy.

Comments

Some surgeons perform a modified total thyroidectomy with the hope of decreasing the chance of removing the parathyroid glands. In other words, when there is uncertainty in visualization and isolation of the parathyroids, a small portion of the gland may be left. These patients are then treated with radioiodine to ablate the remaining thyroid. In reality, the principle is the same (total ablation); in practice, it is accomplished by the removal of approximately 98% of the gland surgically and the remaining 2% with iodine 131.

Proponents of conservative surgery for treatment of primary cancer of the thyroid maintain that the increased risk of postoperative complications in the more radical procedure precludes its routine use. In our opinion, the advantages of total thyroidectomy outweigh these risks. Postoperative morbidity can be largely eliminated by a carefully planned and executed surgical procedure performed by a surgeon specially trained in this technique. Damage to the

recurrent laryngeal nerves and parathyroid glands can be minimized by their careful visualization and isolation by the surgeon.

The principal objection to total thyroidectomy as routine treatment for thyroid cancer is the increased risk of producing permanent tetany (hypoparathyroidism). Of the 218 patients in our total thyroidectomy series, 28 (or 12.8%) had permanent tetany, i.e., lasting more than one year (Table 5). In the majority, tetany has been readily controlled with standard replacement therapy, and in a few cases there has been complete recovery after an interval of two or more years. Thyroid extract administered postoperatively maintained the patients in a euthyroid state.

Table 5.—Tetany in 218 Cases

Surgery	Cases	Permanent Tetany	%
Primary	142	17	12.0
Secondary	76	11	14.5
	—	—	—
Total	218	28	12.8

Survival Rates

Analysis of our data on the 218 patients who had total thyroidectomies shows an 86.5% survival rate at five years, with 122 out of a possible 141 patients. At ten years, 42 out of a possible 50 patients had survived for a rate of 84% (Table 6).

Table 6.—Survival Rates

	Primary	Secondary	Total
5 years	81/94 (86.2%)	41/47 (87.2%)	122/141 (86.5%)
10 years	25/30 (83.3%)	17/20 (85.0%)	42/50 (84.0%)

Summary

Total thyroidectomy, with or without neck dissection as indicated by pathology, constitutes the adequate operation for thyroid carcinoma. "Compartmental" dissection is performed when positive nodes occur *only* high along recurrent nerve; radical neck dissection is done when other metastatic nodes are present. Enlarged contralateral nodes should be removed. If larynx and trachea are invaded, they should be removed. Extensive iodine 131 therapy is used in superficial laryngeal or tracheal infiltration; external irradiation is used in poor metastatic

radioiodine uptake. In distant metastases, total thyroidectomy reduces seeding, prevents terminal tracheal or vascular obstruction, and increases the possibility of radioiodine uptake. Carefully planned and executed surgical procedures by surgeons specifically trained in this procedure reduce postoperative morbidity.

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OBSTETRICS AND GYNAECOLOGY IN THE USSR

WHO Chronicle 20(2): 56-60, February 1966.

One of the outstanding features of obstetric practice in the USSR is that close medical supervision usually begins at a very early stage in pregnancy. Another is that almost all deliveries take place in institutions in which specialist help is readily available; in recent years, indeed, all deliveries in urban areas and 85% or more in rural areas have taken place in maternity homes. A WHO-sponsored travel-

ing seminar that visited the USSR in 1964 has no doubt that these features are largely responsible for the excellent results achieved in reducing maternal and perinatal mortality.

With the exception of deaths from haemorrhage, maternal mortality from obstetric causes appears to have been virtually eliminated in the USSR, most maternal deaths being due to extragenital conditions

associated with pregnancy such as cardiovascular or renal disease. Perinatal mortality rates have fallen to low levels, and even in units to which abnormal cases are referred, such as the Institute of Obstetrics and Gynaecology in Moscow, the perinatal mortality is 20 per 1,000 births or less.

Antenatal care

In the USSR great importance is attached to what is called psychoprophylactic preparation during the antenatal period. Its aim is to produce both mental and physical relaxation by education and exercises, and its main features are: (a) the establishment of control over conditioned reflexes set in train by fear and tension; (b) instruction in the physiological processes of pregnancy and labour; (c) reassurance that labour need not necessarily be painful but stress on the fact that it requires physical effort; (d) the inculcation of confidence in the satisfactory outcome of the pregnancy for both mother and baby; (e) advice on the modifications needed to family life to maintain good health during pregnancy, and (f) the teaching of special methods of relieving pain in labour, such as controlled breathing and massage of the hips and lower abdomen by the woman herself. Psychoprophylactic preparation is claimed to lead to a significant reduction in pain at labour, in many cases abolishing it completely. It is said to shorten labour, reduce the incidence of intrapartum asphyxia and postpartum haemorrhage, and diminish the number of episiotomies and the need for operative intervention in the second stage.

It is the view in the USSR that there is a relationship between the oxygen saturation of the blood and the occurrence of pre-eclampsia. Psychoprophylaxis is felt to improve the oxygen saturation and thus to decrease the incidence of pre-eclampsia. The incidence of the toxæmias of pregnancy certainly seems to be very low; in the No. 3 Maternity Home at Tashkent, for example, it was 2.5% in 1963 for 7,158 deliveries (hyperemesis gravidarum being included). Another likely factor in the low incidence of the toxæmias, however, is the age and parity structure of the population.

The very early institution of thorough antenatal care has virtually eliminated anaemia as a clinical problem. Eclampsia has similarly become very rare, occurring in the Tashkent maternity home mentioned above in only 0.6 per 1,000 deliveries. When it does occur, it is usually treated by the Stroganoff method, with reserpine and diuretics in addition.

Obstetric practice during delivery

Blood transfusion is readily available, and even the maternity units of small peripheral hospitals carry a small emergency stock of blood which can be quickly augmented from central depots. Transfusion apparatus is much simpler than in many other countries; no disposable plastic sets were seen.

Anaesthetic techniques differ between the various centres. For Caesarean section, general anaesthesia—with thiopentone for induction and relaxants and inhalation anaesthetics thereafter—is preferred in the Moscow and Leningrad institutes, whereas local infiltration is employed in Tashkent unless the patient asks for a general anaesthetic. For vaginal procedures, one institute uses ether exclusively, another favours pudendal nerve block.

In the prevention of puerperal sepsis the exclusion of visitors is considered to be of paramount importance, so much so that even husbands are not permitted to enter the wards to see their wives. Some of the aseptic techniques used, however, did not seem to be ideal, but it was claimed that puerperal morbidity had been reduced to between 1% and 2%, and antibiotic-resistant infections were not mentioned as a major problem.

Newborn babies are kept in separate nurseries, and "rooming in" is not favoured. Swaddling is universal, except for small premature babies.

The actual clinical practice of obstetrics in the USSR appears to be very conservative. Caesarean section rates are low; in No. 26 Maternity Home in Moscow, for example, the rate is 1.2%. Operative deliveries by forceps or by vacuum extractor (this being more favoured nowadays) are also uncommon. In the institutions visited by the seminar the antenatal correction of breech presentation by external cephalic version is apparently not performed. In the absence of bleeding, intervention in the third stage of labour is withheld for up to two hours, and ergometrine is not given until after the delivery of the placenta.

Surgical induction of labour is rarely performed. In Leningrad the membranes are apparently not ruptured unless the cervix has dilated to 6 cm. Medical induction is preferred, the patient being given large doses of oestrogens, followed 24 hours later by intramuscular injections of quinine or pituitary extract.

In the management of abnormal uterine action, multichannel tocography is used for diagnosis in the institutes, to provide an indication for the use of quinine and pituitrin. Oxytocin drip infusions are not generally favoured, although they have been used with success for a year or two in the Institute

of Obstetrics in Moscow. Another example of a difference in practice from that of other countries is that in pregnancies complicated by diabetes labour is not induced prematurely and Caesarean section is performed for obstetric reasons only.

Gynaecology

In gynaecology, as in all other fields of medicine in the USSR, great emphasis is placed on prophylaxis.

Because obstetric care during and after delivery is good, major degrees of uterovaginal prolapse have become comparatively rare. Pelvic inflammatory disease, although apparently still quite common, is being reduced in incidence by control of gonorrhoea and measures to prevent illicit abortion. The periodical clinical examination of women over the age of 25 years leads to the early detection of pathological states of the reproductive organs, particularly cancer of the cervix.

Facilities for gynaecological treatment are concentrated in combined obstetric and gynaecological units in maternity homes and district and city hospitals. Outpatient consultations and treatment are given in the women's consultation centres attached to these units. The in-patient facilities of the larger units are usually divided into three sections: surgical gynaecology, non-operative or medical gynaecology, and oncology.

The general approach to gynaecological surgery appears to be similar to that in other parts of the world and to be fairly conservative. The uterus, for example, is usually conserved when fibroids are resected, except in older women, and vaginal hysterectomy is carried out in pelvic floor repairs usually only when the patient has reached the menopause.

Endotracheal anaesthesia, apparently a fairly recent development in the USSR, is now extensively used. At the Second Piragov Medical Institute, Department of Obstetrics and Gynaecology, First Municipal Hospital, Moscow, the pelvic cellular tissues are infiltrated with 0.25% procaine to limit shock during major operations under general anaesthesia. The value of this procedure was demonstrated to the seminar by simultaneous plethysmograph, electrocardiograph, and electroencephalograph recordings.

Endocrinological conditions seem to receive considerable attention. In the larger hospitals laboratories assist in the investigation of menstrual disorders, and in the institutes further investigations into extragenital endocrinological states and deficiencies involving several endocrine glands are car-

ried out. In the institutes the foreign literature on the subject appears to be well known.

Much emphasis is placed on physiotherapeutic methods in gynaecology. Shortwave diathermy, induction therapy, ionization, and medicated baths are used frequently, and spa treatment is popular.

In the Institute of Obstetrics and Gynaecology at Leningrad, congenital aplasia of the vagina is treated by the creation of an artificial cavity lined with pericardium kept in place for two weeks by a sponge rubber obturator. The pericardium, which can be stored for two years, is prepared by the Blood Transfusion Institute from fresh cadavers, and acts as a stimulus, the epithelium of the introitus growing in to line the cavity. The operation is performed only after marriage, so a prosthesis or dilators are not needed to prevent contracture. Ten such operations have been performed at the Institute in a period of eighteen months, and the end result in the case demonstrated to the seminar was certainly satisfactory.

Infertility, though not a common complaint, receives thorough investigation. As a result, genital tuberculosis—previously thought to be rare—is now being diagnosed more frequently; it is found in 7% of infertile patients.

Paediatric gynaecology, which in the USSR is concerned with girls up to the age of 17, receives considerable attention, especially at the Institute of Obstetrics and Gynaecology at Moscow. Specially trained gynaecologists attend the paediatric polyclinics of almost all the *rayon* hospitals in Moscow and other large cities. Although the majority of the patients can be treated as outpatients, some need hospitalization and it is estimated that two beds are required per 100,000 population. The conditions most frequently treated are vulvovaginitis and menstrual disorders, the most important being menorrhagia of the menarche.

Mention has already been made of the periodical examination of women over 25 years of age for the early detection of cancer of the cervix uteri. This examination is performed at least twice a year by members of the gynaecological staff of the district hospital, both in urban and rural areas; and they are responsible for the regular surveillance of all women living in the area served by the hospital. The procedures adopted in the centres visited by the seminar are not uniform. In some, the principal procedure is biopsy of areas appearing on colposcopy to be suspicious; in others, it is cytological examination of cervical smears. Generally speaking, however, the detection of cancer seems as yet to be based on the

investigation of cervixes found on clinical examination to be unhealthy, and mass cytological screening of healthy women is evidently just beginning. If it is extended to the whole population with the thoroughness characteristic of the prophylactic services in the USSR, it should yield important results. The proportion of cancers of the cervix now found in an advanced stage is already much reduced, most cases now being discovered in the early stages.

Carcinoma *in situ* is treated in some centres by conization and serial section of the specimen, in others by electrocoagulation and cytological follow-up. Stage I carcinoma is treated by Wertheim's hysterectomy followed by deep X-ray therapy, and more advanced growths by radium and deep X-ray therapy. The five-year survival rate in Stage I carcinoma was reported to be 75%-80%. It is difficult to compare these results with those in other countries because the extent of spread found at operation is taken into account in the USSR in deciding the final staging.

Contraception and abortion in the USSR

To reduce the risk of pelvic infection after illicit abortions, the USSR has adopted a radical policy in relation to unwanted pregnancies. Contraceptives have been made freely available, and all women have the right to decide whether to have an unwanted pregnancy terminated. This policy is not intended as a measure to limit the growth of the population; indeed, women with large families receive generous maternity benefits, rewards, and decorations.

The contraceptive measures in vogue are appliances such as cervical caps and vaginal diaphragms and chemical methods such as pastes and vaginal tablets. Cabinets of samples were prominently displayed in all the women's consultation centres and factory medical centres visited by the seminar. The subject of contraception has an important place in the health education of women. Contraceptives are supplied free of charge to any woman who asks for them, though if she prefers she can obtain them from a pharmacy.

The so-called rhythm method or safe period is considered to be an ineffective method of birth control. Oral contraceptives are not as yet used for fear of possible harmful effects, but research on them is projected.

Artificial abortion was forbidden by law in the USSR in 1937, but the law was repealed in 1955, the Supreme Soviet ruling that every woman is entitled to have her pregnancy terminated if she wishes, provided that it has not gone beyond the twelfth week. The operation is performed free of charge, except on housewives who are supported by their husbands and do not go out to work; they pay a fee of five roubles. In practice, considerable attempts are made to persuade women seeking artificial abortion to allow their pregnancy to continue. The seminar saw a health education film for the lay public whose theme was the regret that may follow such an abortion and the happiness resulting from continuing with the pregnancy.

A woman wishing to have an abortion performed reports first to her polyclinic. The doctor examining her confirms the pregnancy, then tries to dissuade her from her decision. If he fails he refers her to a gynaecological unit for the operation. The preferred procedure in the USSR is aspiration curettage under local anaesthesia. The patient remains in hospital for three days after the operation, and morbidity is said to be negligible.

The effect on the birth rate in the USSR of the ready availability of contraceptives and induced abortion is difficult to assess. The birth rate is 24.9 per 1,000, but there are evidently considerable variations between the constituent republics. In the Russian Soviet Federated Socialist Republic the average number of children in the family is three. In the Uzbek Soviet Socialist Republic the birth rate is 33.7 per 1,000, 35% higher than that of the USSR as a whole. In this republic artificial abortion is not viewed with favour by the people, among whom—as among rural societies in other parts of the world—large families are common.

The seminar could offer no comment on whether the availability of contraceptives and abortion has encouraged promiscuity or marital instability. Of all the abortions in the USSR, however, 85% are now initiated in hospital, and the remaining 15%, which occur at home, include those beginning spontaneously. The seminar was informed that the number of abortions induced outside hospital by unskilled persons has been substantially reduced in recent years and that the problem of postabortal sepsis has been effectively brought under control.

FROM THE NOTE BOOK

CHROMOSOMES BY MAIL

A scientific exhibit "Chromosomes by Mail" by the Cytogenetics Division of the Laboratory Service was awarded the grand prize in the intern-resident category of the student American Medical Association—E. R. Squibb Company competition at the SAMA meetings in Los Angeles, California, 11-14 May 1966. LCDR T. R. Birdwell MC USN, Senior Resident in Pathology at the U.S. Naval Hospital, San Diego, California showed the exhibit in Los Angeles.

The exhibit is based on a simple mail-in method of blood specimens for leukocyte chromosome culture and subsequent chromosome analysis. The technique was developed in the Pathology Branch by CAPT R. M. Dimmette, Chief of Laboratory Services, Dr. Robert R. Eggen, Civilian Consultant in cytogenetics and LCDR Birdwell with the technical assistance of HM2 F. H. Shelton, USN.

The exhibit was designed and built in the Audio-visual Division of the Hospital Corps School with the assistance of HM2 K. G. Read, Medical Illustrator.

The exhibit will be shown at the annual meeting of the American Medical Association in Chicago in June.—Public Affairs Officer, U.S. Naval Hospital, San Diego, California.

SIX MILLIONTH PRESCRIPTION FILLED

In recognition of outstanding community health service, the U.S. Naval Hospital, San Diego, California was recently awarded an inscribed apothecary jar, marking the six millionth prescription filled at the hospital from September 1959 to March 1966.

In accepting the award, RADM Horace D. War-den MC USN, the hospital's Commanding Officer, expressed the continuing goal of the hospital: to provide our military community with the best inpatient and outpatient medical care possible.

The U.S. Naval Hospital, San Diego, a 74 building complex on about 85 acres, is the largest military hospital in the world. Its Coronado Annex, an outpatient clinic 5 miles from the main hospital, provides outpatient medical care to the large military, retired and dependent population in that area. The annex was established to facilitate the availability of medical care to those separated from the mainland by San Diego Bay. The hospital, an outstanding

teaching institution, as well as a medical treatment facility, is accredited for residencies in 14 of the different medical specialties. It also operates a basic Hospital Corps School as well as conducting advanced courses for several medical technical specialties. It operates 2,050 active beds and averages over 44,000 monthly outpatient visits.—U.S. Naval Hospital, San Diego, California.

ACUTE RESPIRATORY DISEASE AND SULFA RESISTANT MENINGOCOCCUS

The medical problems at home will be limited to acute respiratory disease (ARD) among recruits which causes more morbidity than any other illness or condition in the Navy.

The streptococcus, adenovirus, and meningococcus are the etiological agents of most concern. Streptococcal disease and its sequelae have been studied most intensively. Control measures using Benzathine Penicillin G have been at least 95% effective. This has been fully reported¹ and I will not dwell on this subject. Adenovirus has been most closely associated with the greatest portion of the ARD.² This etiologic agent has been shown to be a common one to many armed forces recruit camps. Meningococcal disease is not an ARD problem, but the association of the carrier state with the nasopharynx has caused me to place it in this category.

Figure 1 shows the magnitude of the problems we will discuss in the recruits at Great Lakes for a five year period. Approximately one of every five recruits has been admitted for ARD. As reported, 2,500 non-bacterial pneumonias occurred in 1961, therefore, about 1/2 of that total in the figure was distributed in the other 4 years. There has been a decreased incidence since 1961. This subject was reported in 1963.³ Meningococcal disease is much more dramatic and risk of death is greater. Of the total of 57 cases, 19 occurred in 1963, but otherwise cases continue to occur sporadically. Rheumatic fever has continued to occur but only in those not protected by benzathine penicillin G. Since continuous year round administration of this antibiotic there has again been a sharp decline in the number of cases.

Adenovirus infections occur in 40-80% of recruits and is considered endemic. Type 4 predominates, but types 3 and 7 also occur. These types are

typically associated with recruit ARD and not expected to cause outbreaks in civilian populations. Adenovirus vaccines, both inactivated and live, have been used in the recruits and have been found to be 40-70% effective in reducing ARD admissions. A recent development which has slowed down the

adenovirus vaccine production is finding that contaminants of the tissue culture systems and type 3 and 7 adenovirus variants cause tumors in infant hamsters. Type 4 has never been incriminated. There has been no evidence of tumor formation in humans.

*Incidence of Illnesses of Concern, Navy Recruits, Great Lakes, Ill.
1960-1964 Inclusive*

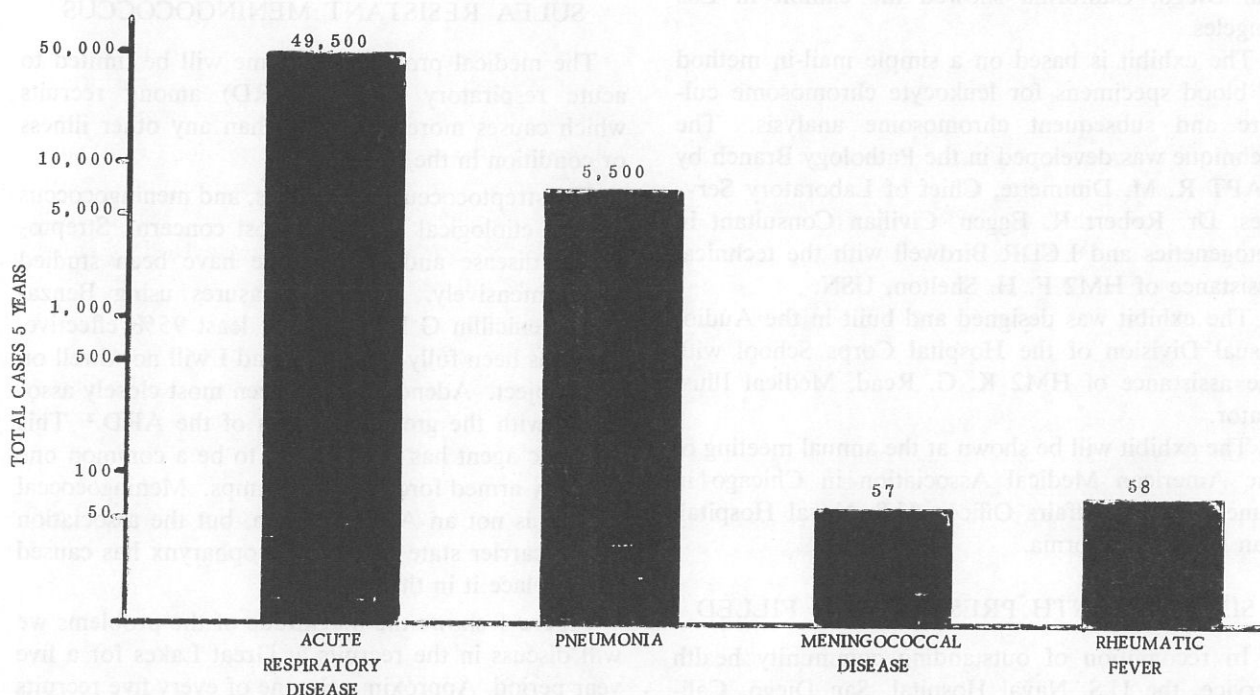


FIGURE 1

Meningococcal disease has continued to occur sporadically. A valuable tool used in the eradication of the carrier state was taken away in 1963 when a sulfadiazine resistant strain of type B meningococcus emerged at the Naval Training Center, San Diego.⁴ Fear that this was caused by wide-spread use of sulfadiazine has been expressed from many quarters. This has not been shown to be true. Sulfadiazine has been given to all recruits upon arrival at Great Lakes or San Diego since 1963 to eliminate sensitive strains and reduce risk of exposure to them. Approximately 1/2 of the cases of meningococcal disease occurring at Great Lakes have been due to sensitive strains. Approximately 5% of incoming recruits at Great

Lakes are carriers of meningococcus and less than 1% are resistant. At the end of 9 weeks the rates are less than 20% positive and from 50%-70% of these are resistant. Sulfadiazine continues to be the best prophylaxis when the strain is sensitive. Other antibacterials only suppress, regardless of sensitivity to sulfadiazine. They do not eradicate. The benzathine penicillin G given as streptococcal prophylaxis has no effect on carrier rates or occurrence of disease. Clinically, large doses of penicillin have become the unequivocal treatment of choice for meningococcal disease. *In vitro* meningococci are sensitive to penicillin.

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—NAMRU-4 Great Lakes, Ill.

DENTAL SECTION

OSSEOUS HEALING AFTER OBLIQUE OSTEOTOMY OF THE MANDIBULAR RAMUS

*P. J. Boyne, J Oral Surg 24(2): 125-133,
March 1966*

The author has answered two problems which have been debatable since the popularity of the subcondylar approach and correction of mandibular prognathism by vertical or oblique osteotomy.

First, has been the lack of agreement concerning decortication. The necessity of decortication has been argued by some surgeons in order to effect bony union.

Secondly, estimates on the length of intermaxillary immobilization, also arrived at empirically, have varied from 12 days to 10 weeks.

The purpose of this study was to observe by fluorescent microscopy of in vivo tetracycline-labeled

specimens, the chronologic and histologic pattern of osseous healing at the site of surgical section in oblique osteotomy of the ramus.

Adult Macaca rhesus monkeys were used. An oblique osteotomy of the ramus was performed bilaterally via the submandibular approach.

Excellent osseous callous formation and bony union was obtained without decortication of the surgically sectioned segments. It would appear from this work that cortex to cortex contact offers ample opportunity for osseous healing.

Also, since osseous healing rates in the rhesus monkey approach that of man, these observations support the clinical practice of using 4 weeks of immobilization in surgical procedures of this type, rather than discontinuing after two weeks, as some surgeons advocate.

(Abstracted by CDR H. S. Kramer, Jr. DC USN, U.S. Naval Hospital, Chelsea, Mass.)

PERSONNEL AND PROFESSIONAL NOTES

MY BIT. Since its beginning in 1955, the American Fund for Dental Education has given \$1,713,381 to maintain and improve the excellence of dental education. The following is a breakdown of the Fund's total allocations:

- 53% Direct Grants to Dental Schools
- 27% Support of the American Association of Dental Schools
- 19% Student Loans
- 13% Teacher Training Fellowships
- 10% Educational Research and Teaching Workshops
- 2% Dental Hygiene, Assisting and Laboratory Technology Scholarships.

Dr. Gerald D. Timmons, Chairman of the fund's 1966 campaign, has quoted Jose Ortega y Gasset,

the Spanish philosopher: "The Educated Man is one who understands and appreciates the intellectual traditions which produced him, and is willing to give of himself, in his lifetime, in order that he might preserve and extend those traditions."

Dr. Thomas F. McBride, Editor of the American College of Dentists, reminds us that: "Every dentist owes an intangible debt to the past members of the profession who made possible the present status of dentistry. In turn, every dentist has an obligation to contribute his 'bit' to the future."

The vast majority of the Fund's support to date has been the American Dental Trade Association, its members, and other corporations. What about all of us? If every dentist in America contributed ten dollars, the American Fund for Dental Education would have another million dollars to use in support of

education in our profession. Send your "bit" to the American Fund for Dental Education, 211 East Chicago Avenue, Chicago, Illinois 60611.

There has been a remarkable display of imaginative giving to the Fund. Some gifts honor anniversaries, birthdays, or serve as "get well" wishes. Some gifts are made in a humorous manner, to honor a bet or climax a party entertainment. Speaker honorariums (after deduction of expenses) have been given to the Fund. Contributions have been made as a tribute to a dental function. At the direction of the giver, the AFDE sends out a specially worded card acknowledging such unique contributions. In this way, not only is a personal thought carried out, but the thousands of young men and women aspiring to serve the public through dentistry also benefit. If you have questions or desire additional information, write directly to the AFDE, at the address above.

MANPOWER IN THE DENTAL CORPS. Numerous studies, dating back for almost two decades, have indicated that the ratio of 1.75 dental technicians per dental officer is inadequate. The new type of sit-down dentistry with high-speed handpieces and a water spray has actually made this inadequate ratio of dental technicians to dental officers extremely detrimental to the comfort and productivity of our dental officers. To bring the dental technician rating structure to a proper ratio would call for 430 more dental technician billets.

By statute, the Dental Corps presently is authorized dental technicians numbering not less than 11 percent of the entire Hospital Corps. The Hospital Corps is bound by statute to not exceed 3½ percent of the enlisted strength of the U.S. Navy and Marine Corps. Thus, while there is no ceiling on dental technicians by statute, large scale increases in the dental technician rating would have to come out of the numbers of the Medical Department hospital corpsmen. Under existing circumstances this is an impossibility.

As an interim measure, to try to get our auxiliary personnel into proper balance, numerous programs are functioning very satisfactorily. It behooves each dental officer to analyse his own situation, to see where he can improve it. This is particularly important because of the additional drains placed on activities by the Preventive Dentistry Program. It will become more important as the Bureau begins to insist that all persons over 25 years of age in the U.S. Navy and Marine Corps receive an annual prophylaxis with the three-agent SnF₂ treatment.

Many activities have added dental hygienists to their rosters. This has been done partially through the strenuous efforts of the Inspector General, Dental, and partially through the initiative of astute and alert dental officers. It takes effort because the commanding officers must be sold on the idea of making the billet and money available. (See U.S. Navy Medical News Letter 47(4): 19, 25 February 1966.)

Many of the alert, hard-driving and farsighted dental officers have set up programs using Grey Ladies through the assistance of the American Red Cross. The Grey Ladies who take part in these programs are very enthusiastic and there is no doubt but that this avenue is another effective means of meeting personnel shortages. (See U.S. Navy Medical News Letter 46(11): 17, 3 December 1965.)

Another possibility is the acquiring of Civil Service GS-2 and 3, dental assistant billets. The first example of this came to the Bureau's attention when CAPT C. A. Stewart DC USN, at the U.S. Naval Air Station, Lakehurst, New Jersey, hired a fine and capable retired Chief Dental Technician B. J. Salesi as a dental assistant, GS-3. Chief Salesi has had great experience in preventive dentistry. He had hoped to get a dental hygienist billet, but for the present this was impossible. The availability of dental assistants, particularly in the GS-2 rating where no experience is necessary, is obvious. Here again, commanding officers must be sold on the existing needs, in order to gain the civilian billets. The fact remains that if CAPT Stewart can do it, other aggressive dental officers can do it too.

Another source of personnel is the Youth Opportunity Corps. YOC summer trainees were used successfully in the Dental Department, Hunter Point Division, San Francisco Bay Naval Shipyard. The dental department at Naval Shipyard, Portsmouth, Virginia, under CAPT A. L. Vogel DC USN has five such trainees working as dental assistants.

It takes no genius to see how these fine girls working as strikers at dental chairs are freeing the better-trained Navy Dental Technicians for preventive dentistry and other duties. SECNAV NOTICE 12310 of 29 April 1966, presents the necessary information in regard to the YOC program. An important feature is the fact that YOC trainees are not charged against the command's current civil service employee ceiling. It is interesting also to note that in this instance the Navy is not paying the salaries. The Navy is merely helping in the rehabilitation of youngsters. For some reason, it appears that dental

department work is a particularly fruitful occupation for this rehabilitation.

Still another area where great benefits are being derived by our more alert, cooperative and flexible dental officers is prosthetic dentistry. While some dental officers buck the use of central dental laboratory facilities and continue to make their own castings, many are taking advantage of central laboratories to cut down on their prosthetic laboratory loads. For example, two years ago the Dental Detachment, Marine Corps Schools, Quantico, Virginia, had 8 prosthetic technicians. By using casting facilities at the U.S. Naval Dental Clinic, Washington, D. C., they have deleted two of their prosthetic billets and are in the process of deleting two more. Consequently, these four billets are being changed

to dental technician, general, billets. Here again, one can readily see the tremendous benefits accrued to the operating dentists, as general technicians become available to them and to the Preventive Dentistry Program.

As one views the methods that various activities are using to solve their personnel problems, one comes to the inescapable conclusion that the alert, aggressive, flexible and far-thinking dental officer can and does manage, by one method or another, to get his dental officer-dental technician ratio into an acceptable balance. The person who is plagued with personnel problems should ask himself to what degree he has pursued the above five avenues and what can be done in his activity to produce personnel improvements.

AEROSPACE MEDICINE SECTION

CAPT BOSEE PRESENTED THE HARRY G. MOSELEY AWARD

CAPT Roland A. Bosee MSC USN, Head, Aviation Medicine Equipment Branch, Bureau of Medicine and Surgery, Department of the Navy, while in attendance at the 37th Annual Scientific Meeting of the Aerospace Medical Association held in Las Vegas, Nevada, received the Harry G. Moseley Award for his outstanding contributions in the field of Flight Safety.

The Harry G. Moseley Award was established in memory of the late Colonel Moseley in recognition of his material contributions to Flight Safety. It is sponsored by the Lockheed Aircraft Corporation and is awarded annually for the most outstanding contribution to Flight Safety.

CAPT Bosee received the Bachelor of Arts degree in 1932; Bachelor of Science, 1934 (Chemical Engineering); and Doctor of Philosophy (PhD) in Biochemistry, 1937.

He entered the Navy in June 1940 and after completing flight training was designated a naval aviator. Subsequently, he was assigned to the Naval Aircraft Factory, which became the Naval Air Engineering Center. He functioned as altitude projects officer and later as Assistant Operations Officer, Mustin Field. In June 1943 he was ordered to the USS BATAAN (CVL-29) and served as Flight Deck and V-1 Division Officer and later as Assistant Air Officer. From October 1944 to December 1945 he

was Air officer aboard the USS MATANIKAU (CVE-101). During the two and one-half years aboard the carriers he participated in many South Pacific operations, including Truk, Ponape, Hollandia, Chichi Jima, and others. He participated in the landing operations on Japan and remained in the Japanese area until late fall 1945, after which the ship returned to the United States.

In January 1946 he was ordered to the Staff, Technical Training Command, Pensacola, Florida, and while serving in that assignment prepared a complete course of study including lesson plans subsequently used in the Aviation Boatswains Mates School. Additional assignments with the Technical Training Command included Officer-in-Charge, Instrument School, and Officer-in-Charge, Aviation Boatswains Mates School.

In January 1947 and until September of the same year he was Air Group Commander, Air Group 67.

In October 1947 he reported to the Naval Air Test Center, Patuxent River, Maryland, and shortly thereafter transferred to the newly established Medical Service Corps of the U.S. Navy. In January 1949 he became Head of the Aviation Physiology Branch (now the Aviation Medicine Branch).

While assigned to the Naval Air Test Center, CAPT Bosee was involved in the development and flight evaluation of many items of pilot and safety equipments. He was instrumental in improving carbon monoxide detecting techniques and devices, pro-



Presentation of the Aerospace Medical Association's annual Harry G. Moseley Award "for the most outstanding aerospace medical contribution to flight safety" is made to CAPT Roland A. Bosee, U.S. Navy, by Dr. C. I. Barron, medical director for the Lockheed-California Company. At the association's 1966 convention held recently in Las Vegas, Nevada, CAPT Bosee was cited for his two decades of work in testing and evaluating aviators' protective equipment. His work, according to the Navy, "has been instrumental in the saving of many lives." Lockheed this year took over sponsorship of the Moseley Award, which is accompanied by a \$500 honorarium.—Corporate Headquarters, Lockheed, Burbank.

protective helmets, and pressure breathing oxygen equipment.

From January 1953 until June 1956 he was Test Director at the Naval Parachute Facility, El Centro, California. During his tour of duty at the Parachute Facility, CAPT Bosee participated in many parachute jumps and ejection seat tests to operationally assure himself of the suitability and reliability of new approaches and concepts of escape systems. He played a major role in the development of the integrated parachute harness system and the test and development of automatic parachute release systems.

In July 1956 he reported to the Naval Air Engineering Center, Philadelphia and served as Deputy Director, Air Crew Equipment Laboratory, which was later redesignated the Aerospace Crew Equip-

ment Laboratory, and received orders as its Director in June 1958.

During his original tour at the Naval Air Engineering Center, CAPT Bosee designed and supervised the construction of the 40' x 10' low-pressure chamber currently in use as a tool for 'space' investigations. It was originally conceived and used for the Navy's first investigation of pressure cabin fighter aircraft.

For years he has played a major role in the improvement and test of the Navy's full pressure suit. He had directed laboratory research and development leading to the acceptance of the Navy suit by the National Aeronautics and Space Administration for use as a space suit for the Project Mercury Astronauts.

In May 1964, CAPT Bosee reported to the Bureau of Medicine and Surgery for duty and for additional duty at the Bureau of Naval Weapons. Currently he is Director, Crew Systems Division, Naval Air Systems Command.

He has been author or co-author of many technical papers relating to the philosophy of various escape and survival principles and has participated as project officer and prepared technical reports relating to aviation medicine and engineering concepts.

CAPT Bosee is the only active aviator in the Medical Service Corps. He is jet qualified.

CAPT Bosee is a 'Fellow' of the American Institute of Chemists; a senior member of the American Chemical Society; a member of the Aerospace Medical Association; the New York Academy of Sciences; the Association of Military Surgeons; the American Association for the Advancement of Science, and the Society of American Military Engineers. He is qualified for and listed in 'American Men of Science'. In 1959 CAPT Bosee was appointed a member of the Aerospace Medical Panel of the Advisory Group for Aeronautical Research and Development (AGARD) in NATO. He is also a member of the National Research Council Committees on Vision and Bioacoustics. He is a fellow in aviation medicine, Aerospace Medical Association, and associate fellow in the Institute of Aeronautical Sciences. In May 1963, CAPT Bosee was elected to membership in the International Academy of Aviation Medicine.—AeroMed, BuMed.

HELICOPTER CAPSULAR ESCAPE SYSTEM FEASIBILITY PROGRAM

By CAPT Roland A. Bosee MSC USN.

The Navy has proved the feasibility of using a capsular-escape-system concept to save helicopter occupants during in-flight emergencies. A test conducted at the Naval Aerospace Recovery Facility, El Centro, California, on 31 March 1966 resulted in successful in-flight initiation, operation, and recovery of the helicopter capsular escape system. The test was historic as it was the first in-flight encapsulation and recovery of a capsule by severance of a structurally intact fuselage, jettisoning of rotor blades, and deployment of recovery parachutes.

The test vehicle was an H-25 helicopter configured for remote-controlled flight. The helicopter with the capsule-escape system installed was flown to an altitude of 2,000 feet, where at a speed of 55 knots, the system was actuated and functioned as designed.

The prime advantage of the capsular type escape system is that the passengers play a passive role. No actions are required by the passengers to save their lives. Only a single actuation by the helicopter pilot, or other aircrewman if the pilot is incapacitated, is required to initiate a series of completely automatic sequences which result in recovery of the occupied section of the fuselage.

The capsule system is being designed to ensure recovery when initiated at 100 feet in hovering flight and at lower altitudes with forward speed. The capsule sequence following a single action by the pilot is: (1) Jettisoning of the rotor blades to provide a clear area for parachute deployment; (2) severance of the structurally intact fuselage to separate the occupied and unoccupied fuselage sections; (3) ignition of separation rockets on the unoccupied fuselage section to thrust it away to preclude collision between the sections and (4) after a time delay, ballistic deployment and ballistic spreading of the parachute to recover the occupied fuselage section or capsule.

Three more tests will be conducted to gather data to guide future development efforts. The Navy has formulated a program which, it is hoped, will gain tri-service support for the development and ultimate installation of an operational helicopter-capsular-escape system.

CNO/BUMED AEROMEDICAL TEAM MAKES SECOND VISIT TO SEASIA

Between 25 March and 16 April 1966 the Aeromedical Team of Flight Surgeons, CAPT R. E. Leuhrs, CAPT F. H. Austin and CAPT R. G. Ireland again visited Navy and Marine Aviation units operating in Southeast Asia. The Team's itinerary included the following:

- Saigon
- USS Ticonderoga
- USS Enterprise
- USS Hancock
- Da Nang, Chu Lai, Phubai
- USS Kitty Hawk
- USS Ranger
- Naval Air Station, Cubi Point, Survival School
- Commander Seventh Fleet

Through observation of flight operations and interview with Flight Surgeons, commanding officers, pilots and others, the Team inquired into the multitude of factors which influence pilot and crew morale and fatigue, and investigated problems concerning pilot safety and survival equipment.

The Team reported to the Chief of Naval Operations and related the conclusions and recommendations which had been made to Carrier Division Commanders and Commanding Officers on-scene.

As on the first visit, the Team was impressed with the strong leadership and professional performance of the entire aviation organization in combat and combat support operations. The on-scene Flight Surgeons are performing an outstanding job of surveillance and support, and thereby materially contributing to combat effectiveness. The Chief of Naval Operations, ADM David L. McDonald, announced in an article in the Navy Times of 11 May 1966 that there is "no indicated evidence of combat fatigue among pilots, but they (the Team of Flight Surgeons, Ed.) indicated that their formal report, now in preparation, might propose some guidelines to prevent the situation." ADM McDonald stated that, "at the same time some preventive measures may be taken just to make sure pilots are not inadvertently pushed beyond acceptable limits."

The factors affecting morale and fatigue are usually operationally established, and thus often correctable best through operational change. But the Flight Surgeon and his supporting medical personnel must keep his commander fully advised on the physiological and psychological status of his personnel. This can only be done through an intimate knowledge and energetic daily surveillance of the personnel, their environment and their commitments. (AvMed Ed.)

COLLATERAL FLYING HAZARDS

Cockpit, The Society of Experimental Test Pilots, page 9, February 1966.

In today's pressurized cockpits, the exposures to high cabin altitudes are becoming increasingly rarer but the infrequency of exposure in itself may make it less natural for a pilot to adapt to the unaccustomed environment.

One of our members recently reported that he is recovering from surgery for a hiatus hernia which was received under rather interesting circumstances.

A brief description of a hiatus hernia may be in order for those readers who are not checked out on the condition. It consists of a protrusion of the stomach through the diaphragm into the chest cavity. Many of such protrusions occur at the point where the esophagus passes through the diaphragm. A comparatively large number of test pilots past fifty years of age are living with this condition but in most cases it does not present any problem if not aggravated

by sex on a full stomach (one's own) or other activities that will induce similar pressures at the point of the injury. A real bad tear such as the one to be discussed justified surgery to relieve the discomfort.

The test pilot who was the victim of this encounter was climbing in company with a lady flight test observer in an unpressurized jet Provost. Being of an extremely modest nature, like most test pilots, our hero bore intense internal pain rather than to relieve himself in a logical and natural manner under the existing circumstances.

At 29,000 feet he suffered the disconcerting experience which he describes as "feeling my stomach collapse inwards."

As a result of this disastrous experience, he subscribes to the verse composed by a poet of long ago:

"Where e'er ye be

Let the wind blow free!"

NEW REFERENCES FOR THRESHOLD LIMIT VALUES FOR TOXIC MATERIALS

In aircraft, aboard carriers and in other aviation environments, a question often arises concerning exposure to toxic materials. The latest revised reference is BUMED Instruction 6270.3D of 15 February 1966. Another recent publication which might be useful aboard ship is *PUBLIC HEALTH SERVICE PAMPHLET NO. 1097, OCCUPATIONAL DISEASES, A Guide to Their Recognition*. This publication is available from the Government Printing Office for \$2.25.

In any emergency, BUMED Code 73 can assist with determination of toxic contents of any material, either through reference to publications available in-house or through the National Research Council Advisory Center on toxicology.

RECOVERY RATES WITH DESCENT FROM HYPOXIA-INDUCED PERIPHERAL VISUAL FIELD LOSS

W. L. Smith

Purpose of Experiment

Experimentation on peripheral visual field loss with exposure to altitude and subsequent recovery rates with descent was undertaken at the Aviation Physiology Training Unit, U.S. Naval Air Station, Norfolk, Virginia. Two fundamental questions that have plagued this training unit's instructors for some time are: (I) What is the extent of peripheral visual field loss as man is exposed to the environmental situation of reduced atmospheric pressure without

the benefit of supplemental oxygen? (II) How rapid is the rate of recovery of the visual field under a given set of descent-from-altitude conditions that approximate "Letdown" descent rates? An attempt to answer these questions is the purpose of the basic, necessarily unsophisticated experiment described in this study.

A review of the literature failed to reveal a clear picture of the magnitude and recovery rates of the peripheral visual field loss. It is noted that some investigators found it difficult to determine, in the process of measuring loss of the peripheral visual field, what portion of the measured loss was due to retinal factors, i.e., lowered oxygen saturation of the bloodstream affecting the sensitivity of the rods and cones with respect to their thresholds, and what was due to extraretinal factors, i.e., increasing loss of attention on the part of the subject as he becomes increasingly more hypoxic.

Summary

The loss of the peripheral visual field at altitude and recovery rates with descent were studied by the use of the FEREE-RAND Simplified Perimeter and a low-pressure chamber.

A total of five subjects were measured at elapsed time intervals at 18,000 ft altitude for determination of the magnitude of peripheral visual field loss. Results showed a substantial loss in the order of 16-17 percent at the end of the 20-minute elapsed time interval.

Recovery rates were found to be rapid with measuring done at 5,000 ft after descent at 5,000 fpm, and at ground-level pressures after a descent at 500 fpm to simulate "letdown" descent rates. Results from ground-level measurements indicated an overall terminal recovery of 14.7 percent of the original baseline visual field area.

Recommendations

The author's recommendations are: (i) that basic research be initiated for measurement of peripheral visual field loss and the rate of recovery from this loss to obtain more accurate definition as to their magnitudes, (ii) that in correlation with these studies, basic physiological parameters be constantly monitored, i.e., ECG, EEG, respiratory rate, blood pressure/pulse pressure, $p\text{CO}_2$, $p\text{O}_2$, $p\text{N}_2$, and $p\text{H}_2\text{O}$ to correlate any compensatory mechanisms with increase or decrease of the visual field, (iii) that the importance of extraretinal versus retinal factors be delineated, if possible, and (iv) that a longer statistical population be utilized.

(Abstract of paper presented at the Twenty-second Meeting of the AGARD Aerospace Medical Panel Sept 1965, Fuerstenteldbruck Air Base, Germany.)

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AIR TRAFFIC CONTROLLER HEALTH PROGRAM

An improved medical examination program for Federal Aviation Agency air traffic personnel, designed to both safeguard employee health and assure maximum performance in high-stress occupations, was announced 1 November 1965. This is the culmination of several years of study and planning.

At present, only controllers working in airport traffic control towers are required to pass annual medical examinations (of a type originally designed for commercial pilots). The program will require an annual examination for all of the Agency's controllers and specialists who work in 21 air route traffic control centers, as well as in 278 airport traffic control towers.

The new examination procedure is specifically designed to detect the early indications of health problems which are related to this occupation. Early detection would permit corrective action to be taken to protect the health of traffic control personnel, to determine their effectiveness in the job, and to insure the safety of the flying public.

The air traffic controller is the vital human link in the vast network of air-to-ground communication and navigation facilities and is responsible for insuring safe passage through the airspace for all civilian and military aircraft. While the Federal Aviation Agency has been modernizing and automating its air traffic control system as rapidly as possible, the even more rapid increase in the speed and passenger carrying capacities of aircraft has added heavily to the burden of responsibility carried by controllers.

In the course of an eight-hour day one controller may carry responsibility for as many as several hundred aircraft carrying several thousand persons. He may be dealing with as many as 25 aircraft at any given moment. Bad weather and traffic concentrations at peak hours add to the stress inherent in this type of work.

The medical program provides for the application of the results of several years of careful research, by

FAA's Office of Aviation Medicine, on the amount of stress-induced disease to which air traffic controllers are exposed. Researchers have found that this type of work ranks very high among stress-laden occupations.

The unions and professional societies, which nationally represent the 14,000 air traffic controllers and air traffic specialists, were all advised of the Federal Aviation Agency's intention to provide this health program and invited to comment on it. The response from these organizations, while cautious in regard to the employment rights of personnel failing to meet examination standards, has been encouraging, and their principal suggestions have been incorporated.

Joseph A. Gascoigne, Executive Director of the Air Traffic Control Association, Inc., commented that the "establishment of a program such as that proposed is considered to be in the best interests of controller health and personal welfare as well as safety to the flying public through consequent efficiency of the air traffic control services provided."

J. F. Griner, National President of the American Federation of Government Employees (AFL-CIO), said frankly "we feel that the type of health program proposed should be an improvement in the prevention of air accidents that might be the result of the controller's physical condition."

The medical examination, performed at Agency expense, will concentrate on vision, hearing, and the cardiovascular and nervous systems. It will also include chest X-rays, electrocardiograms and tests for glaucoma, as well as psychological tests which will be evaluated by an Agency clinical psychologist. Where deemed advisable by the FAA regional flight surgeon, follow-ups and referrals to specialists will be made.

Where a controller's health has suffered from the conditions of his work to the point where his personal welfare or the public safety may be involved, he may be relieved of his duties, until such time as corrective treatment has returned him to normal health. In appropriate cases, he will be retrained or reassigned to

similar but less arduous duties, if possible, or in the absence of a reasonable alternative, retired with disability compensation.

The objective of the program is to retain as far as possible the services of the highly trained and skilled traffic control personnel by anticipating and preventing the onset of disease conditions which might eventually interfere with their health and effectiveness. Many stress-induced disease conditions are reversible if identified and treated in time.

The various types of air traffic personnel will be expected to meet standards in accordance with the severity of stress conditions which have been found to exist in their work. Accordingly, the new physical qualification levels are less demanding in the overall sense than the current airman standards for commercial pilots which terminal controllers have previously been required to meet.

In addition to the medical program, the Federal Aviation Agency is continuing to perfect other means of safeguarding the health of controllers and to reduce the degree of stress within the occupation. These include the establishment of new standards for recruitment, the development of electronic equipment for automating much of the detail work, improvement of the controller's working environment and possibly earlier retirement.

(The Department of Defense has agreed to support the FAA medical surveillance program with some services performed in military medical facilities. BUMED NOTICE 6320 of 27 Sep 1965 applies. AvMed Ed.)

MANNED ORBITING LABORATORY

LT Philip T. Briska MC USN, a flight surgeon/ naval aviator, is the first naval flight surgeon to be ordered to the Manned Orbiting Laboratory, Los Angeles, California, for duty. This increases the Navy's participation in this project and it is anticipated that additional flight surgeons will be rotated through this assignment in the next few years.—AeroMed, BuMed.

EDITORIAL DESK

SPECIAL ARTICLE

WHY REPORT DEFECTIVE MATERIAL?

You must report it because such reporting will bring dividends to you and to the entire Navy Medical Department. These dividends will *not* be in the form you are accustomed to. However, your personal attention and help will insure a thorough and vigorous investigation, processing and reporting of each defective material complaint.

Your dividend will be in having the satisfaction of knowing that, principally through your efforts and personal leadership, the entire Medical Department will receive better medical and dental materials in the future.

Without documentation, it is not possible for the Bureau of Medicine and Surgery to exert sufficient pressure on the purchasing activity (Defense Personnel Support Center in Philadelphia) to initiate corrective action. This situation is analogous to the old bromide about the weather, "Everyone talks about it, but no one does anything about it." In the Navy everybody complains verbally when products of particular manufacturers are received from the Defense Supply Agency Medical Distribution System, but few bother to register written, official complaints supported by evidence.

The Bureau, being a large organization and a user, not a buyer, of the item, requires written documentation of complaints in order that the purchasing activity may have documented evidence. The defect or malfunction must be substantiated by its own or Armed Forces Laboratory testing. The result of the testing is presented to the manufacturer and/or to appropriate authorities for legal action leading to disbarment of the manufacturer from future bidding or award of contracts.

The Bureau of Medicine and Surgery, in conjunction with the Army and Air Force Medical Services and the Defense Medical Materiel Board, has devoted considerable time and energy in developing the joint procedures for reporting defective material. The Joint Fleet Material Support Office-Field Branch, Bureau of Medicine and Surgery Instruction 6700.16B defines three different types of defective or unsatisfactory material and delineates the minimum amount of required information. When information regarding defective or unsatisfactory material is not forwarded, the felony is compounded for if there are

not a sufficient number of complaints against a manufacturer's product, the purchasing agency has no recourse against acceptance of additional material from the same supplier. It is therefore absolutely necessary that a written report be forwarded to document the case and insure that corrective action can be initiated.

We are also aware of the fact that approximately 50% of the complaints received by the purchasing activity are, after review, research and laboratory testing, unsubstantiated, and that the material is suitable for issue and use.

Like most other things, it is quality rather than quantity that counts the most in the long run. Therefore, we must be certain that complaints lodged against material were not due to faulty technique or lack of technical knowledge. A Federal Stock Number denotes and identifies one item of supply. Each item purchased is required to conform to a set of essential characteristics and specifications. The item may be manufactured by many suppliers and each supplier will indicate, either on the label or by enclosed instructions, how his product is to be prepared and/or used.

It is very important to the Bureau and to the purchasing activity that everyone associated with medical material be familiar with the Joint Instruction for reporting defective materials, and uses the indicated procedures when the activity renders reports. This Joint Instruction classifies defective material as follows:

Type I—Material which has been determined by use or test to be harmful or defective to the extent that use has or may cause death or illness.

Type II—Material which is suspected of being harmful, defective, deteriorated, or otherwise unsuitable for use.

Type III—Equipment which is determined to be unsatisfactory because of malfunction, design, defects (attributable to faulty material, workmanship and/or quality inspection), or performance.

Defective material reports must list the information specified in the Joint Instruction and Type I reports are to be submitted to the Defense Personnel Support Center, Philadelphia, Pennsylvania, with copies furnished to the Defense Medical Materiel

Board, Washington, D.C. and the Field Branch, Bureau of Medicine and Surgery, which is now located in Philadelphia. On Type II and Type III reports, only Field Branch, Bureau of Medicine and Surgery, is furnished copies.

Remember that no corrective action concerning defective or unsatisfactory material can be initiated unless a written complaint is received by the purchasing activity.—Code 4, BuMed.

MEDICAL SERVICE CORPS INSERVICE PROCUREMENT PROGRAM FOR FY 1967

Interested hospital corpsmen and dental technicians who intend to apply for appointment as Ensign, MSC, USN, for the Fiscal Year 1967 inservice pro-

DEPARTMENT OF THE NAVY

**BUREAU OF MEDICINE AND SURGERY
WASHINGTON, D.C. 20390**

OFFICIAL BUSINESS

PERMIT NO. 1048

gram are reminded to review BuPers Instruction 1120.15G (revised 22 February 1966).

Significant changes in this instruction require candidates to make written applications to their commanding officers prior to 1 August vice 1 October as in previous years. The Officer Selection Battery tests (OSB) must be ordered between 1-15 August, and the next OSB test will be administered on 15 November 1966. The professional examination for the FY 67 program will be administered in February 1967 vice May as in previous years.

Candidates are reminded to furnish the Chief of Naval Personnel (B-623) a copy of their requests for the OSB indicating the specialty of their choice.—MSC Div, BuMed.

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